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**VL4™**

# **Wash Luminaire**

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**02.9628.0010**

**7 Oct 1997**



**VARI\*LITE®**  
The Automated Lighting Company

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Korea Patents No. 92,269; 76,310; 47,673; 42,641; 42,640; 42,639; Korea Design Reg. No. 175,178;

Mexico Patent No. 180,766; 180,687; 180,148; 179,138;

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Spain Patent No. 2.031.748; 548.328; Design Patents No. 134.458; 134.491; 129.596; 129.595;

Taiwan Patents No. 212,234; 61,420; 57,219; 53,673; 52,156; 40,611; 28,275;

United Kingdom Design Reg. No. 2056387; 2056386; 2029499; 2033108; 2042174; 2045352.

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# VL4™ Wash Luminaire Service Manual

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# Foreword

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This technical manual is confidential property of Vari-Lite, Inc. All information contained herein is the sole and exclusive property of Vari-Lite, Inc and may not be used, disclosed, or reproduced in any manner without the prior written consent of Vari-Lite, Inc.

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This manual supersedes all existing **VL4** luminaire information and procedures. The following Vari-Lite technical publications are superseded by this service manual and should be discarded.

02.3004.0024 VL4 Maintenance Procedures Manual

02.9628.0002 VL4 Illustrated Parts Breakdown

02.9628.0003 VL4 Maintenance Procedures

This manual incorporates distinct type styles to differentiate between certain types of text. These styles are defined as follows:

**Boldface** Trademarked or registered product. Example: **Artisan**<sup>®</sup> control console

*Italics* Words with specialized meanings such as luminaire attributes. Example: Luminaire *intensity*

***Bold Italic*** Highlighting trademarked products within titles. Example: ***Artisan Control Console***

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**RE: Comments to VL4 Wash Luminaire Service Manual (02.9628.0010)**

**FROM:**

**DATE:**

PAGE 1 OF 1

***Copy or tear this page from manual, complete, and fax  
(or mail) to Product Support Department***

## **Comments:**

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# Chapter 1. Introduction

This chapter contains the following sections:

- 1.1 General Information
- 1.2 Equipment Description
- 1.3 Photometric Data
- 1.4 Location of Major Luminaire Components
- 1.5 Principles of Operation

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## 1.1 General Information

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### 1.1.1 About This Manual

This manual describes specific information regarding description and installation of the **VL4™** wash luminaire. It provides test, fault isolation, and repair procedures for the purpose of general service and repair of the luminaires. The manual is intended for use by Vari-Lite personnel and by Vari-Lite's customers/clients. The following equipment items are covered in this manual:

<b>Equipment Description</b>	<b>Part Number</b>
<b>VL4 Wash Luminaire</b>	20.9628.0001

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### 1.1.2 Documentation

#### 1.1.2.1 Technical Manuals

Procedures for operating and maintaining a **Series 200™** or **Series 300™** system are contained in **Series 200** System Manual (02.3004.0200) and various equipment manuals. Programming procedures are contained in the Operator Programming Manuals, which are kept with the console. There are currently two programming manuals: 02.3004.0010 (**Artisan®** and **mini-Artisan®** control consoles) and 02.3004.0210 (**Artisan®Plus**, **mini-Artisan®Plus**, and **mini-Artisan®2**).

All of the ACS equipment are contained in the ACS Equipment Service Manual (02.9623.0200). Each luminaire and console has its own service manual. Both types of **Artisan** consoles are covered in the **Artisan** Control Console Service Manual (02.9622.0101). The **mini-Artisan** consoles are covered in separate service manuals.

Procedures for inspecting and preparing equipment for shipment are found in the **Series 200** System Equipment Preparation and Inspection Procedures (02.3004.0042).

---

#### 1.1.2.2 Technical Bulletins

Technical bulletins are issued from the Dallas, Texas USA office. They are updates to documentation that discuss changes to the equipment, software, and the latest available information concerning **VARI\*LITE** equipment. Technical bulletins are categorized by assembly or subassembly, and identified by a number such as VL4-005 (**VL4** luminaire Technical Bulletin number 5).

### 1.1.3 Maintenance Philosophy

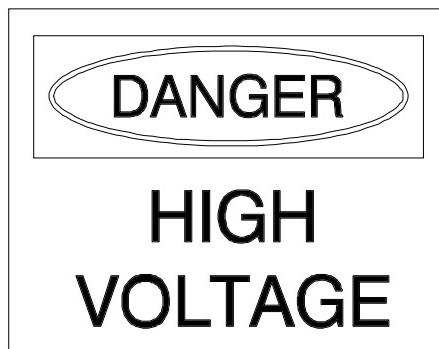
The fault isolation and maintenance sections of this manual provide a logical path of fault isolation and repair designed to return the equipment to proper operation in most cases. The fault isolation procedures for the equipment end item have been broken into two sections, which lead the technician to maintenance procedures that he/she can reasonably be expected to perform.

The criteria for separating fault isolation and maintenance procedures into two sections can be defined by Class 2 and Class 3 repairs. Class 2 repairs only require the technician to replace an end item subassembly or easily accessible component (e.g., a fuse) in order to return the equipment to proper operation. Class 2 repairs are applicable to situations in which tools and/or experience of the technician are limited, or time does not permit extensive maintenance. Class 3 repairs (identified as *Shop Only*) involve in-depth repair to subassemblies that have been identified as faulty. Class 3 repairs are applicable to situations in which tools and experience of the technician allow for more extensive procedures. In some cases, even though a technician may have the ability and resources to perform extensive repair, he/she may decide to replace the entire subassembly in order to return the equipment to proper operation more quickly. The subassembly could then be repaired at a more appropriate time.

It is extremely important to note that while many of the commonly identified solutions to equipment failure are provided in this manual, it does not cover all possible situations. Contact the appropriate Vari-Lite Support Group if you have questions or if the procedures given do not solve the problem.

### 1.1.4 Recommended Safety Practices

This section describes the various types of safety factors to be considered while installing and operating **VL4** luminaires.



#### Equipment High Voltage

All components of the **Series 200** and **300** systems use high voltage to operate. These voltages can produce death on contact. When working around or within powered components and cables, extreme caution must be used. When conditions permit, maintenance should be performed with power off.

#### Luminaire Hanging

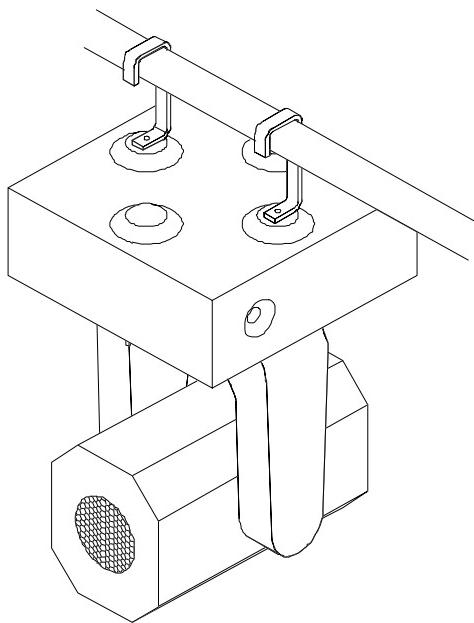
Safety is the prime consideration when hanging luminaires. Safety far outweighs any concern about operator convenience, speed of load-in or load-out, or ease of changing-out luminaires when the truss is in the air. The first consideration must be whether the truss or pipe can safely support the weight of the luminaires and repeaters. The second consideration must be whether the luminaires are securely attached so they cannot possibly come off the truss or pipe (even if the truss goes 90° from horizontal due to a failure of the chain motor or fly system). In addition to mounting hooks, all truss-mounted equipment are provided with a safety cable to prevent the equipment from falling off the truss. The safety cable is connected to the equipment's base, looped around the truss, and then reattached to the equipment base. The cable should be wound tightly, leaving as little slack as possible.

#### Lamp Handling

Due to the use of high power lamps (bulbs) in all **VL4** luminaires, the heat of the luminaire head can reach temperatures of around 400°F when the lamp is lit. To aid in the airflow circulation within the luminaires, after dousing the lamps, wait ten minutes before removing power to the luminaires. This will provide enough time for the equipment fan to cool off the unit, which will increase lamp life.

- When handling a lamp, use the ceramic base to hold the lamp. Do not touch the glass part of the lamp. If you touch the glass part with your fingers, wipe off the fingerprints with alcohol. Oils contained in the skin, and therefore the fingerprints, deteriorate the glass when the oils are heated causing hot spots on the glass. Lamps could explode at these hot spots.
- On occasion, lamps have exploded. Wear protective glasses whenever the covers are removed from the head of the luminaire and the lamp is exposed.
- Use care when opening and closing the rear door of the **VL4** luminaires. Any jarring of the rear door can undo the optical alignment of the lamp.
- In the event that a large quantity of luminaires need to be optically aligned, wear dark glasses during the alignment procedure to prevent eye strain. In addition, always operate the lamp in the closed housing. There is a danger of glare due to high luminance. Also, a high portion (three to five percent) of the consumed electrical power is given off in the form of ultraviolet radiation.
- When operating arc lamps, allow luminaires to operate for at least three minutes. It takes about three minutes for the fill components (mercury and halogen-metal compounds) in the lamp tubes of 250-, 400- and 600-watt lamps to vaporize completely. If the lamps are switched off earlier than three minutes, the fill components are partially vaporized. The inadequately vaporized fill components and the electrode material (tungsten) are deposited in the areas of the lamp tubes that have remained cool. As a result, the lamp tubes blacken prematurely and reduce the service lives of the lamps.
- Luminaire heads should be tilted to the horizontal position before starting lamps. The lamps generate light in an electrical discharge arc, whereby the electrons from the two electrodes excite the fill components to give off light. Because of the alternating current position, the electrons are alternately given off by the two electrodes. When a lamp is set in a vertical position, the halogen-metal compounds, which determine the color temperature of the lamp, collect at the top end of the glass envelope. When the lamp is started, color deviations occur since the concentration of halogen compounds is greater around the top electrode than the bottom electrode. In addition, the fill components that are difficult to vaporize congeal around the bottom electrode, thereby reducing the service life of the lamp.
- When system will be unattended for more than two hours, luminaire lamps should be doused. Otherwise, if system will be unattended for less than two hours, system can remain in standby.

## 1.2 Equipment Description



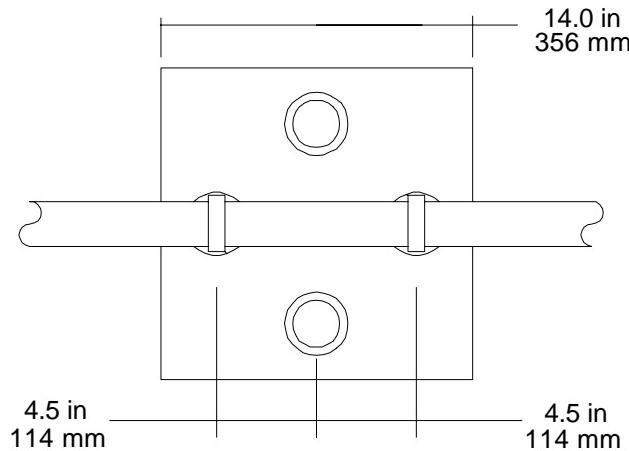
The **VL4** wash luminaire is a light weight, fully-automated lighting instrument. The luminaire uses a 400 watt metal halide arc source lamp with an aluminum parabolic reflector to produce a powerful wash beam. The head assembly contains mechanisms for control of intensity, color, and beam attributes. Beam color is provided by crossfading dichroic color filters featuring independent cyan, magenta, and amber color panel control. A mechanical dimmer provides smooth full-field control at all light levels and a shutter/douser provides fast blackouts, bumps, and strobe-like effects. The position of the lamp in respect to the reflector may be varied to change the beam angle from spot to flood, providing further beam output versatility. A glass diffuser containing textured glass provides diffusion capabilities. The rear housing provides access to the lamp, through which the beam shape may be adjusted.

The **VL4** head and yoke assembly is mounted on an electronics chassis, which houses components for lamp power and luminaire control. The chassis contains an arc power supply (APS), voltage selector board, pan mechanism, cooling fan, and two processors for luminaire control.

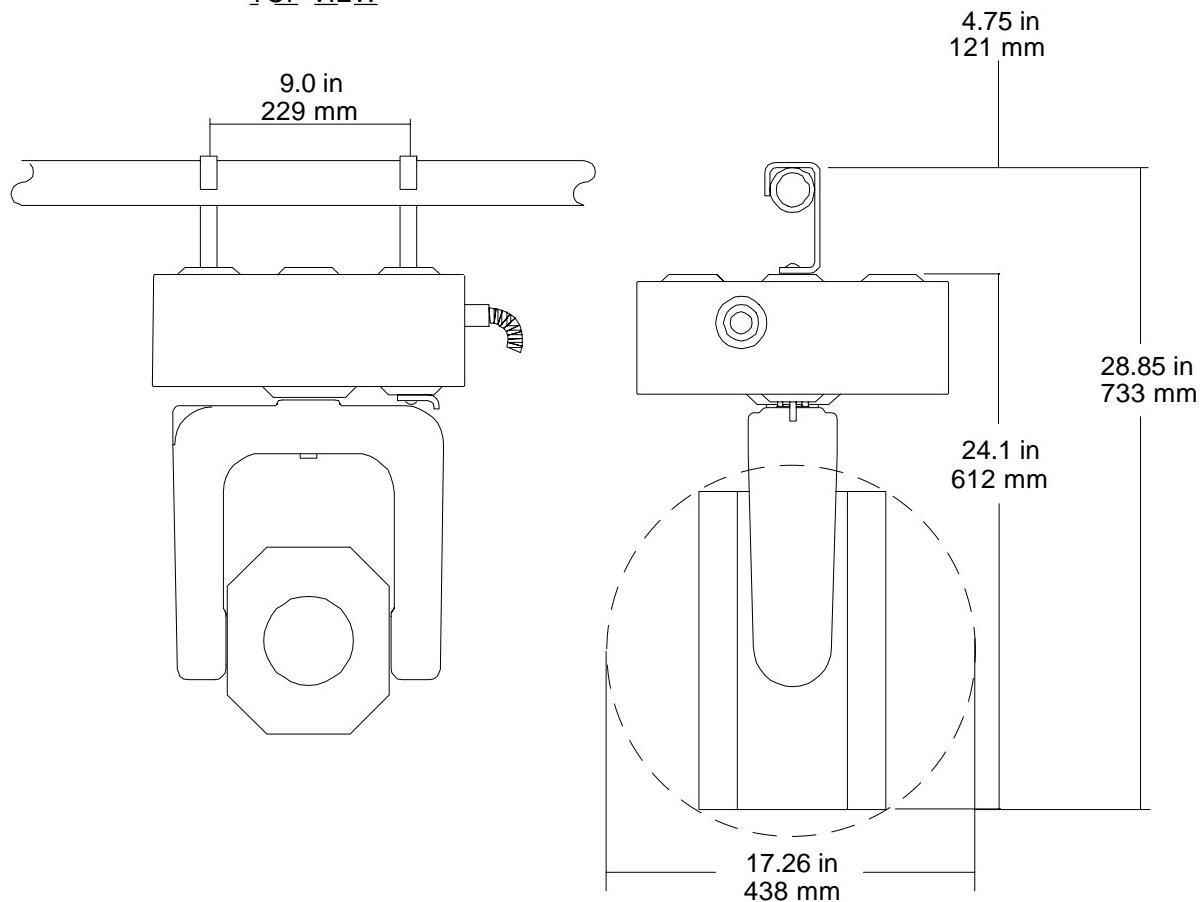
### 1.2.1 Dimensions and Weight

The VL4 luminaire weight is 38 pounds (17.24 kg).

**Note:** Refer to **Figure 2-1** in Chapter 2 for luminaire clearance and truss hook hanging dimensions.



TOP VIEW



FRONT VIEW

SIDE VIEW

---

## 1.2.2 Technical Specifications

### 1.2.2.1 Description

#### Light Source

OSRAM HTI SE 400W metal halide arc lamp, 5000°K.

#### Power Requirements

85 to 265 VAC, 50/60 Hz, 3 to 8A depending on the line voltage.

#### Reflector

Chemically brightened aluminum parabola.

#### Cooling

Forced air.

#### Light Output

2000 foot-candle at 20 feet (center beam with maximum intensity).

#### Control Processor

Two Motorola 68000 processors operating at 12 MHz with 256k RAM and 256k ROM.

#### Operating Temperature

0° to 120°F (-18° to 49°C)

---

### 1.2.2.2 Programmable Functions

#### Color

Dichro\*Tune™ crossfading dichroic color changer with independent control of cyan, magenta, and amber color panels.

- Color change speed      0.3 second

#### Color Correction

3200°K preset, selectable from console.

#### Intensity Control

Mechanical dimmer provides smooth full-field control at all light levels.

Shutter-type douser provides strobe-like effect.

- Blackout time      0.5 second
- Open or close      0.1 second
- Repetition      2 cycles per second (maximum)

### Focus (Pan/Tilt)

Digital servo system with 320:1 speed range.

- Velocity            240 degrees per second (maximum)  
                        0.75 degrees per second (minimum)
- Accuracy           0.3 degree resolution
- Pan                 360 degrees in 3.0 seconds
- Tilt                270 degrees in 2.7 seconds

### Beam Diffuser

Beam size variable by movable lamp mount from spot to flood.

Beam edge variable by travelling textured-glass diffuser panels, from sharp to soft in 0.5 second.

### Beam Size Control

Position of lamp in reflector may be remotely varied via the console to change the beam angle from spot to flood.

## 1.3 Photometric Data

The chart below represents beam specifications for the **VL4** luminaire. Specifications are given for spot diffusion and flood diffusion.

**VL4 Wash Luminaire with 400W Metal Halide Lamp**

LENS and LAMP SETTINGS	DIFFUSION	CANDELA (cd)	BEAM ANGLE (degrees)	BEAM DIAMETER TN*	FIELD ANGLE (degrees)	FIELD DIAMETER TN*
HTI 400 W/SE (Narrow Beam)	Spot	876,000	4	.07	11	.19
	Flood	126,400	11	.19	24	.42
HTI 400 W/SE (Wide Beam)	Spot	235,200	9	.16	20	.35
	Flood	81,200	14	.24	29	.52
HTI 404 W/SE (Narrow Beam)	Spot	1,012,000	4	.07	10	.17
	Flood	146,400	11	.19	24	.42
HTI 404 W/SE (Wide Beam)	Spot	576,000	5	.09	15	.26
	Flood	107,200	13	.23	28	.5

\* Multiply distance by Tn to determine coverage.

To calculate Illuminance (I) at a specific distance (D);  $I = \frac{cd}{D^2} (\cos \theta)$

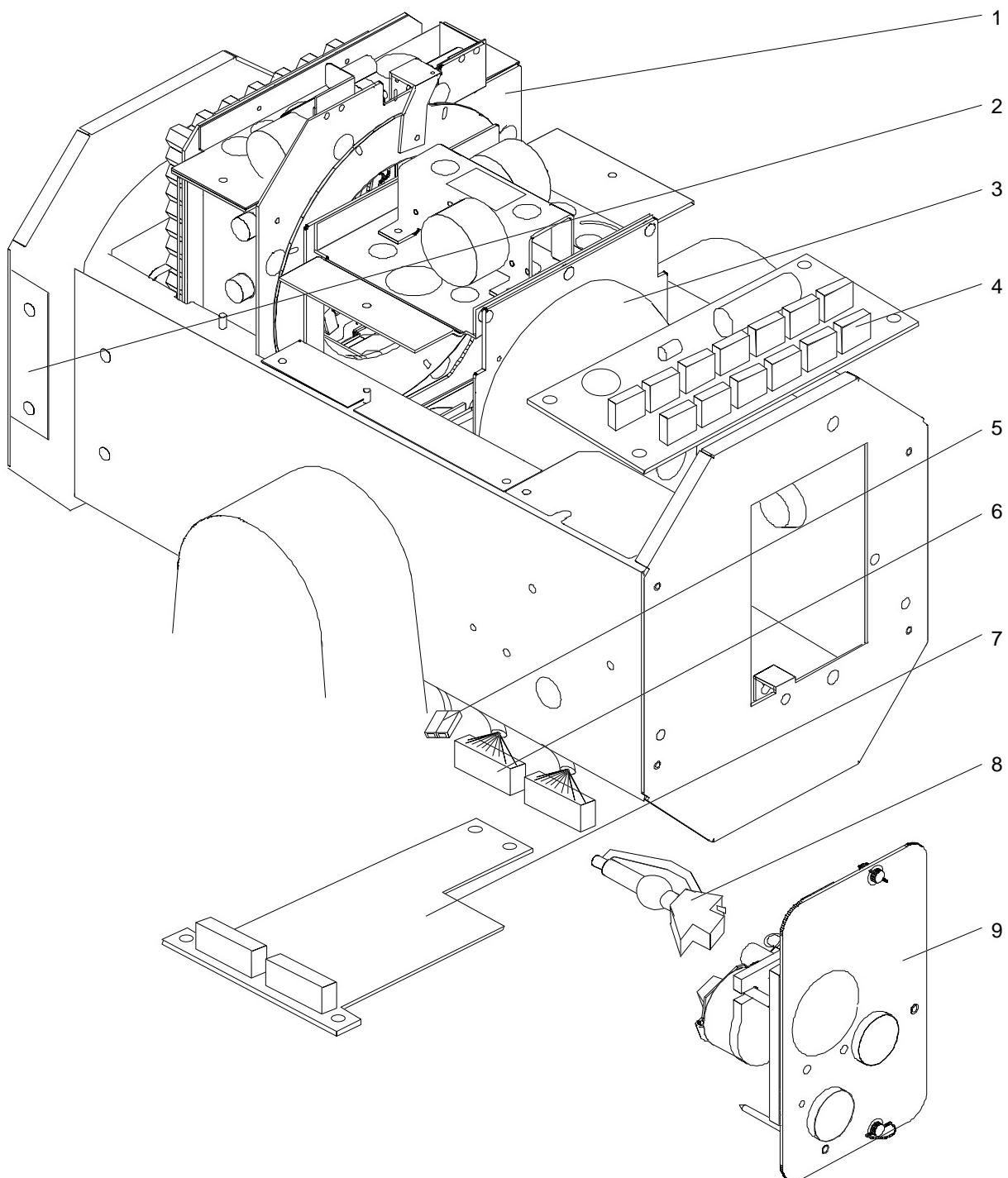
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## 1.4 Location of Major Luminaire Components

### 1.4.1 Head Components

Ref. No.	Name	Description
1	Dimmer/Filter /Douser Assembly	Contains dimming iris for limiting apparent light beam brightness, magenta dichroic filters, and douser mechanism for fully obscuring light beam.
2	Diffuser Assembly	Contains two sets of five diffuser panels to obscure light beam to vary apparent focus.
3	Blue/Amber Bulkhead Assembly	Contains blue and amber dichroic filters. Two stepper motors control angle of filters in light beam. Chemically brightened aluminum parabolic reflector directs light from arc lamp forward through color filters, dimming iris, and douser mechanism.
4	Ignitor Board Assembly	Develops high-voltage pulse for arc lamp.
5	Lamp Cable Assembly	Contains high-voltage lamp cables and ground cable.
6	Yoke Cable Assemblies	Provide power to yoke termination board via two 26-pin connectors.
7	Yoke Termination Board	Provides motor and sensor wiring connections to head assemblies.
8	Lamp	OSRAM model HTI SE 400W metal halide arc light source (5000°K) operates at 400 watts for up to 250 hours.
9	Rear Bulkhead and Bulb Mounting Assembly	Contains lamp mounting and linear actuator motor to control focus. Knurled knobs are used to align bulb in forward direction. Assembly is removable from luminaire head using two 1/4-turn fasteners.
	Tilt Mechanism (Not Shown)	Drives belt driven pulley to tilt luminaire head. Interconnected to yoke termination board for power and data.

## Head Components (continued)

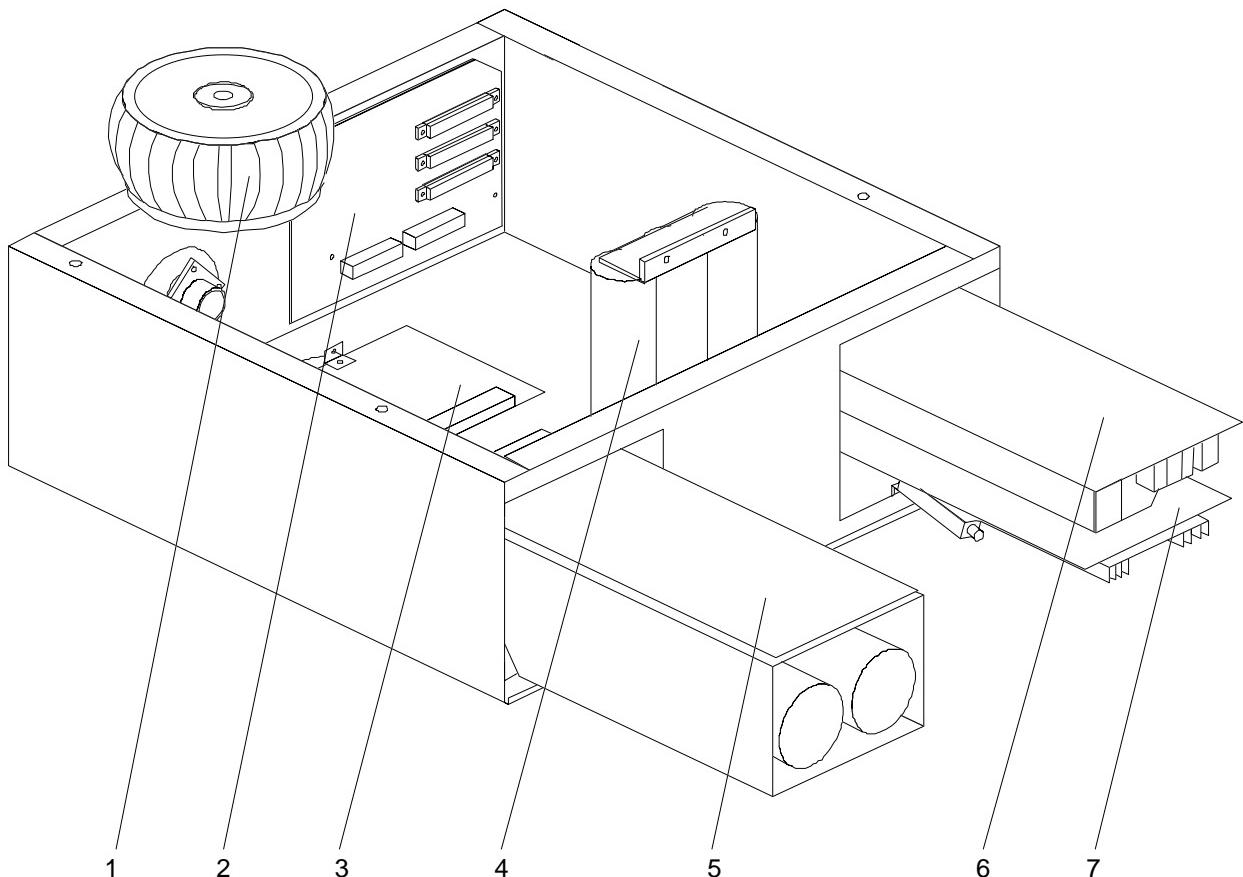


## 1.4.2 Electronic Chassis Components

Ref. No.	Name	Description
1	Transformer/Capacitor Assembly	Provides unregulated DC power from AC input for use by lamp power supply assembly and low voltage supply PCB assembly. Consists of connectorized transformer assembly and connectorized capacitor assembly.
2	Motherboard PCB Assembly	Located at rear of upper enclosure. Routes power to the luminaire electrical components.
3	Voltage Selector Board	Senses amplitude of AC input power (85 to 130 or 170 to 260 VAC) and switches transformer primaries in series (220 mode) or parallel (110 mode).
4	Capacitor Assembly	Part of Item 1.
5	Arc Power Supply	Provides regulated AC power to lamp.
6	Lamp Control Electrical Assembly	Consists of universal control board and lamp control board. Controls stepper motors, system timing, pan/tilt and incandescent dimming, shaft encoder interface, and sensor inputs. Controls various luminaire functions, communicates with console, and stores cue data.
7	Low Voltage Supply Board	Regulates lamp power.
*	Cooling Fan	Located in yoke bearing frame. Forces cooling air through hollow yoke arms to lamp. Blows air directly across lamp for maximum cooling.
*	Pan Mechanism	Located in yoke bearing frame. Drives belt-driven pulley to pan luminaire head. Interconnected to motherboard for power and data.

\* Not shown.

## Electronic Chassis Components (continued)



---

## 1.5 Principles of Operation

### 1.5.1 Operation Overview

Operation of the luminaire is provided by software within the luminaire. The processing functions are carried out on the universal control board (composed of the lamp control board and the interface board).

The voltage selector board senses the incoming voltage and automatically configures the power supplies for either 110 or 220 VAC. Lamp power is provided by the arc power supply plus. From the low voltage supply board, the voltage is channeled to the following main mechanical subassemblies:

- Blue/amber bulkhead assembly
- Diffuser assembly
- Dimmer/filter/douser assembly
- Rear bulkhead and bulb mounting assembly
- Pan mechanism and tilt mechanism.

---

### 1.5.2 Operation Description

#### 1.5.2.1 Electronics Components

##### Voltage Selector Board (VSB)

The voltage selector board senses the amplitude of the AC input power and switches the transformer primaries in series (for 220 mode) or parallel (for 110 mode). When in 110 mode, the voltage selector board accepts an incoming voltage of between 85 and 130 volts. When in 220 mode, the voltage selector board accepts an incoming voltage of between 170 and 260 volts.

##### Transformer/Capacitor Assembly (XFMR)

This assembly provides unregulated DC power for use by the lamp power supply assembly and low voltage supply board.

##### Low Voltage Supply (LVS 4)

The low voltage supply PCB provides DC voltage regulation for the luminaire.

##### Motherboard PCB Assembly (MBD 4)

The motherboard routes power to the luminaire electrical components.

### Universal Control Board (UCB)

The universal control board is a dual-processor control board. One processor is the main controller. It communicates with the console via the communications link, executes commands it receives, operates the pan and tilt servos, and issues stepper motor commands to the second processor, whose sole purpose is to control the stepper motors.

### Interface Board (IFB Located on UCB)

The interface board contains the circuitry to interface the microprocessors on the universal control board to the mechanisms of the luminaire such as pan and tilt servo systems, and stepper motors controlling color, dimmer, diffuser, and focus mechanisms. In addition, it serves to control the voltage power level of the lamp power supply.

### Arc Power Supply Plus (APS+)

The arc power supply plus provides controlled square-wave current, ignition voltage, and operating voltage required by the arc lamp.

---

### **1.5.2.2 Bulkhead Assemblies**

#### Rear Bulkhead and Bulb Mounting Assembly

The rear bulkhead and bulb mounting assembly contains the lamp and the lamp alignment controls. The knurled knob alignment controls aid in the redirection of the lamp in the X and Y planes.

#### Blue/Amber Bulkhead (BAB)

This assembly contains two sets of glass dichroic filters and the reflector. Two motors control the angle at which the filters intersect the light beam, thereby producing the desired color.

#### Dimmer/Filter/Douser Assembly (DFD)

The unit contains a dimming iris assembly, the magenta dichroic filter motor, and the douser for fully blacking out the light beam.

#### Diffuser Assembly (DIFF)

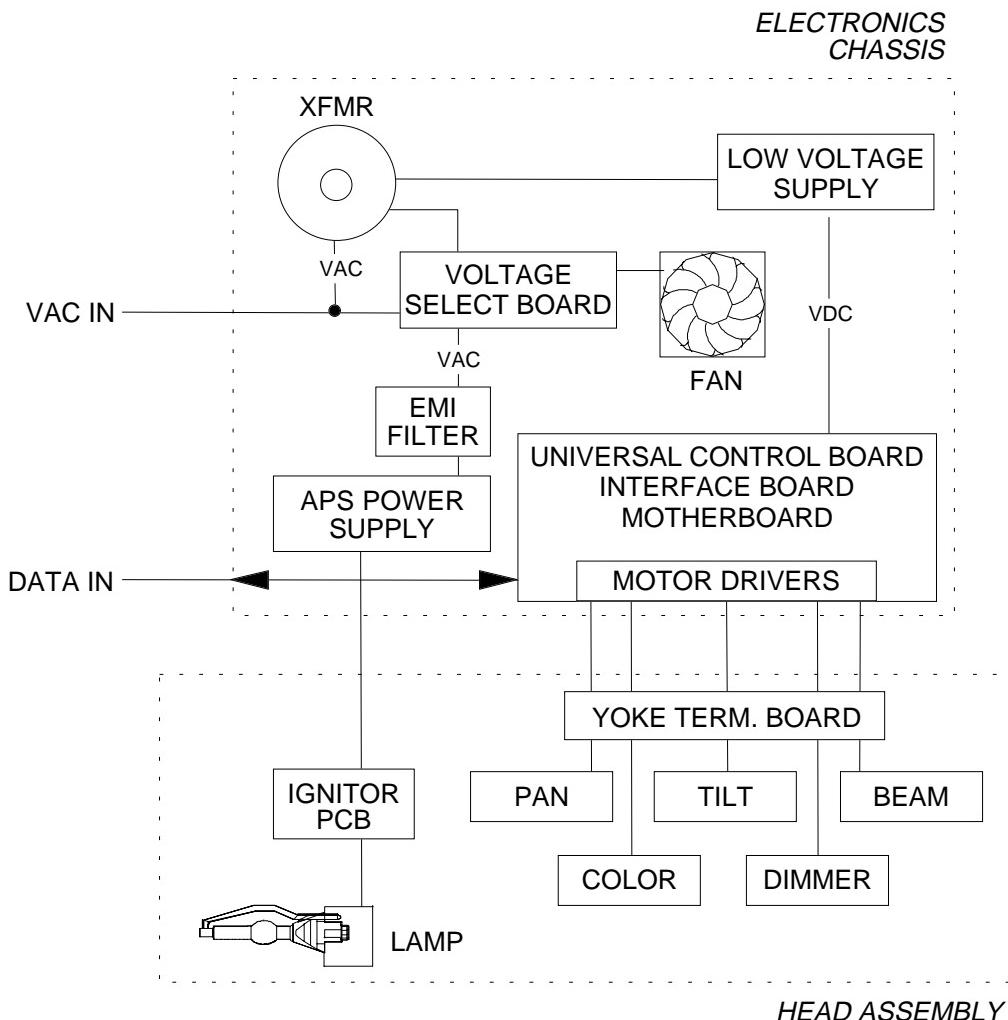
The diffuser assembly consists of two sets of five diffuser panels. There are three types of diffuser panels, each having a different diffusion pattern.

#### Ignitor Board Assembly (IGN 4)

The ignitor PCB is mounted remotely from the arc power supply, inside the luminaire head. The ignitor circuit generates up to 3300 VDC, which is applied to the spark gap. When the 2.5 kV spark gap fires, the pulse is stepped-up to 10 kV and the start pulse is applied to the arc lamp.

### 1.5.3 Data and Power Flow Diagram

Input data and power is supplied to the luminaire via the **Series 200** connector on the electronics chassis. Power is directed to the voltage select board (VSB). The VSB switches the transformer primaries for the appropriate mode. Power is distributed to the APS power supply, which supplies operating voltage for the lamp, and the low voltage supply, which supplies DC voltage to the control boards. Control boards receive power and data, distributing to the main mechanical assemblies located in the luminaire head assembly.



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## Chapter 2. Installation and Checkout

This chapter contains the following sections:

- 2.1 Installation
- 2.2 Checkout
- 2.3 Installing **VL4** Accessories
- 2.4 Lamp Optical Alignment

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## 2.1 Installation

### 2.1.1 Luminaire Hanging

**VL4** luminaires can be hung from a truss or similar structure by one of several methods. All methods utilize hanging clamps called truss hooks. **VL4** luminaires have four receptacles for hook connection.

For an in-depth explanation of hanging methods, refer to **Series 200** Installation and Checkout Manual (02.9622.0010).

#### 2.1.1.1 Distance-To-Distance Requirements

Refer to the following table for **VARI\*LITE** luminaire distance-to-distance requirements.

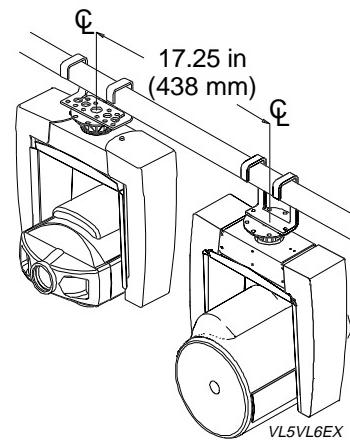
Luminaire	VL2B/ VL2C	VL4	VL5/ VL5B/ VL5Arc	VL6	VLM
<b>VL2B/ VL2C</b>	21.50 in. 546 mm	19.50 in. 495 mm	19.75 in. 502 mm	19.00 in. 483 mm	19.50 in. 495 mm
<b>VL4</b>	19.50 in. 495 mm	17.50 in. 445 mm	17.75 in. 451 mm	17.00 in. 432 mm	17.50 in. 445 mm
<b>VL5/VL5Arc/ VL5B</b>	19.75 in. 502 mm	17.75 in. 451 mm	18.00 in. 457 mm	17.25 in. 438 mm	17.75 in. 451 mm
<b>VL6</b>	19.00 in. 483 mm	17.00 in. 432 mm	17.25 in. 438 mm	16.50 in. 419 mm	17.00 in. 432 mm
<b>VLM</b>	19.50 in. 495 mm	17.50 in. 445 mm	17.75 in. 451 mm	17.00 in. 432 mm	17.50 in. 445 mm

**Example:** To find center-to-center distance between **VL5** and **VL6** luminaire:

Step 1. On chart, find **VL6** luminaire on top row and **VL5** luminaire on side row

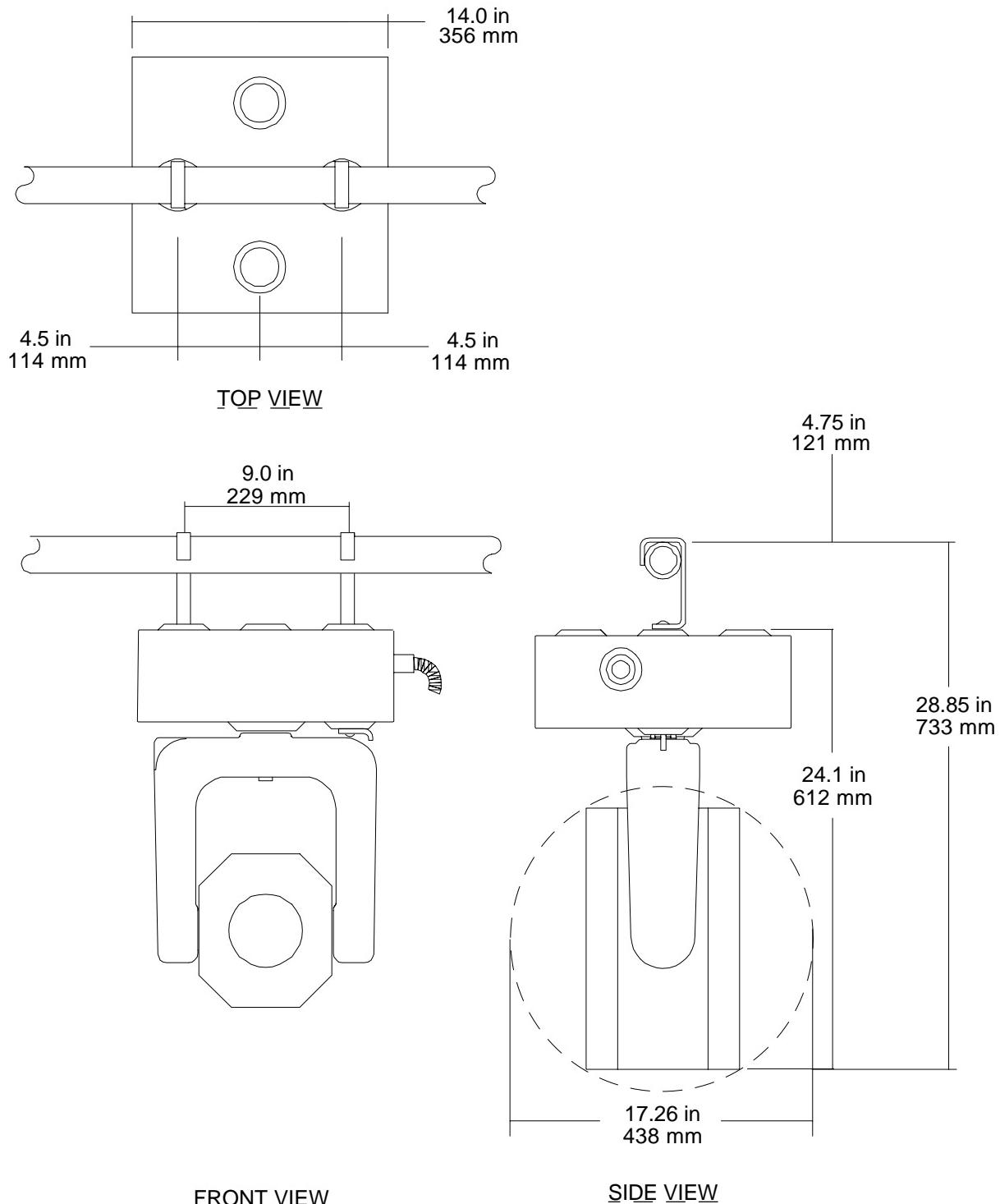
Step 2. From **VL6** luminaire on top row follow chart down. From **VL5** luminaire on side row follow chart to right.

Step 3. Where two rows meet is correct distance (17.25 in. or 438 mm).



### 2.1.1.2 Clearances

**Note:** The VL4 luminaire requires 3-1/2 inches (8.89 cm) clearance between the chassis assemblies of adjacent luminaires.



**Figure 2-1. VL4 Luminaire Hanging Clearances**

## 2.1.2 Luminaire Packing

In order to ensure that luminaires are not damaged during shipment, it is important to properly pack in the case.

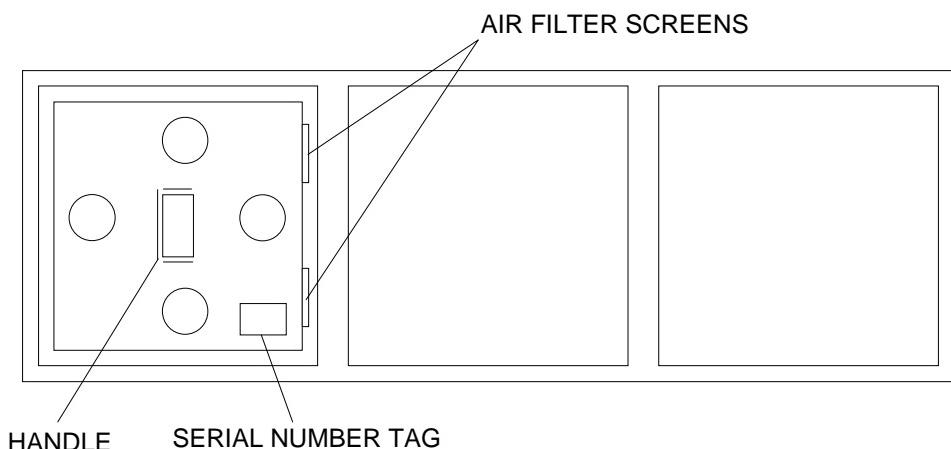
When packing **VL4** luminaires into road cases, it is important to load them so that the air screens are in the case lengthwise. This orientation prevents the screens from being pulled loose when the luminaires are unpacked. This also prevents bending the chassis top cover.

In order to ensure that luminaires are not damaged during shipment, it is important to properly pack in the case.

**CAUTION:** Ensure yoke is not resting against pan stop when packing.

### To pack **VL4** luminaire:

- Step 1. At console, run pack-up cue to place luminaire in proper orientation for transport. (Pan should be 180° from stops and tilt halfway between stops.)
- Step 2. Disconnect luminaire input cable from system and remove luminaire from truss.
- Step 3. Place luminaire in road case as shown.
- Step 4. Close and latch road case lid, ensuring all latches are properly secured.



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## 2.2 Checkout

Use this procedure to verify proper equipment operation.

### 2.2.1 Power-Up

- Step 1. Connect luminaire to a **VARI\*LITE Series 200** console through an ACS rack or truss repeater.
- Step 2. Supply system power to luminaire.
- Step 3. Watch for luminaire calibration. If luminaire does not calibrate, check lamp cable connection. Refer to Test and Fault Isolation sections in Chapter 3 as needed.
- Step 4. Verify that luminaire responds to control console commands. (Instructions for exercising luminaire functions should be referenced from the console operator's manual.) If luminaire does not respond properly, refer to Test and Fault Isolation sections in Chapter 3.

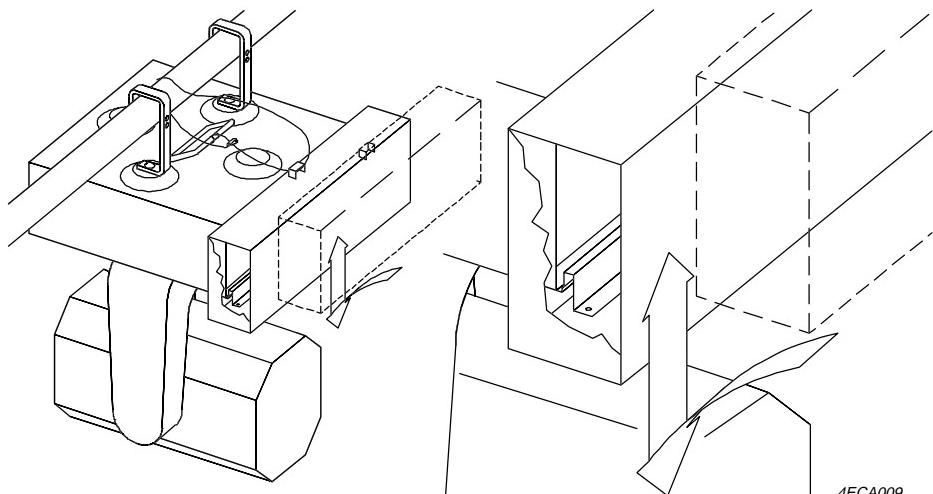
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## 2.3 Installing VL4 Accessories

### 2.3.1 Installing Sound Baffles

Some hang locations require a reduced noise environment. Fan noise in luminaires can be greatly reduced by using the **VL4** luminaire sound baffle.

No hardware is used to secure the sound baffles to the luminaires when the luminaires are hung from trusses. The sound baffles are secured to the luminaire with safety cables. For ground installations, safety cables are not required. For all uses of the sound baffles, the baffle fits over the fan opening and air filter. It is necessary to remove the air filter from **VL4** luminaires before installation.



#### To install sound baffle:

- Step 1. Route safety cable through eyelet in sound baffle.
- Step 2. Align sound baffle with air intakes.
- Step 3. Push down bottom flanges of baffle between bottom lips of fan intakes and air filters.
- Step 4. Push up top flanges of baffle between top lips of fan intakes and air filters.
- Step 5. Ensure that baffle fits snugly.

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## 2.4 Lamp Optical Alignment

The proper focus of the luminaire occurs when the source of illumination (lamp) is on the optical axis of the parabolic reflector. The optical alignment can be achieved by moving the hotspot to the center of the beam using the horizontal and vertical adjustment knobs on the lamp access plate of the luminaire.

### To optically align lamp:

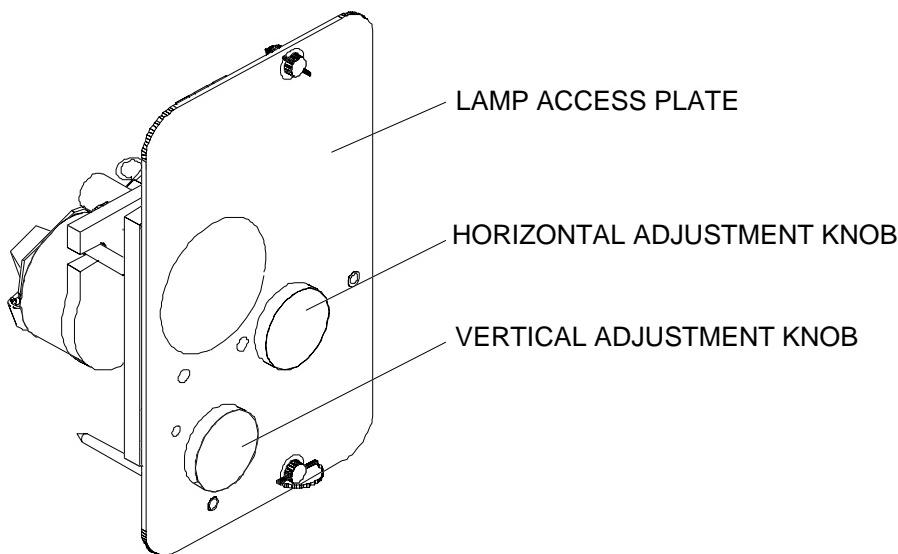
- Step 1. Connect luminaire to control console.
- Step 2. Start lamp and allow few minutes for lamp to warm up.
- Step 3. Choose flat surface such as floor or wall onto which to direct light beam. This makes light beam hotspot visible.
- Step 4. Focus beam on flat surface with no color and no diffusion.
- Step 5. At console, turn BEAM control knob counterclockwise one-half turn. Dark spot at center of beam should almost disappear.

---

**CAUTION:** To avoid breaking lamp, if there is difficulty in turning horizontal and vertical adjustment knobs, and lamp feels like it is striking parabolic reflector, turn knob in other direction.

---

- Step 6. Identify horizontal and vertical adjustment knobs on lamp mounting plate. Use these knobs to move hotspot to center of beam. Turning adjustment knobs quickly eases the location of hotspot in beam.



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# Chapter 3. Maintenance Procedures

This chapter contains the following sections:

- 3.1 Test Procedures
- 3.2 Luminaire Fault Isolation
- 3.3 Luminaire Maintenance Procedures

## **Periodic Maintenance**

Refer to **Series 200** System Equipment Preparation and Inspection Manual (02.3004.0042) for periodic maintenance procedures for new and used equipment.

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## 3.1 Test Procedures

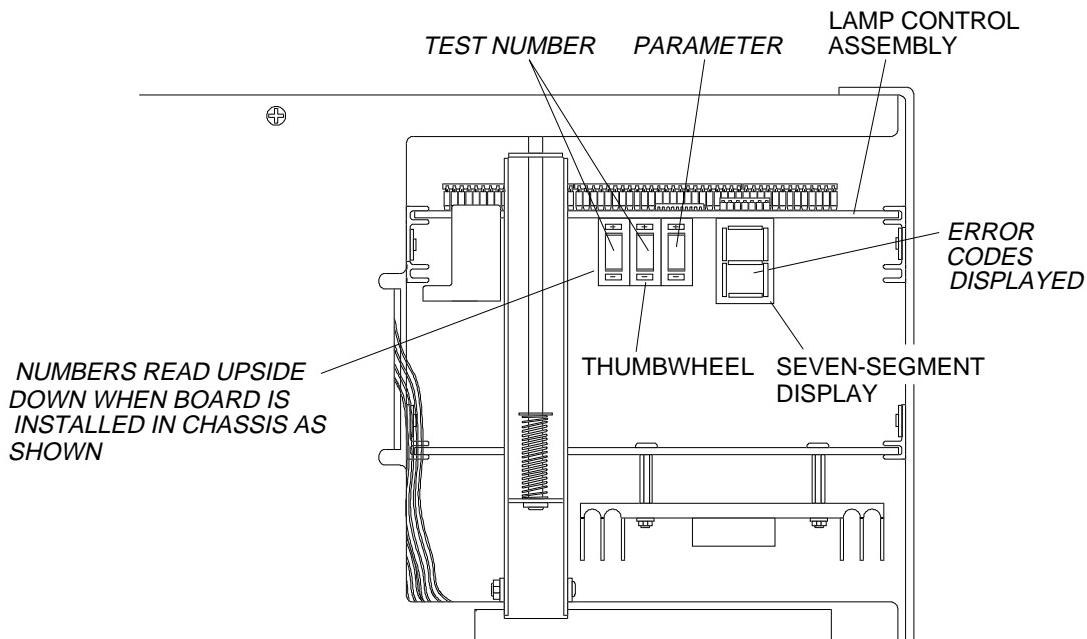
### 3.1.1 Test EPROMs

#### 3.1.1.1 Description

The VL4 luminaire has the ability to use diagnostic EPROMs to aid in troubleshooting. After installation of the EPROMs on the lamp control assembly's universal control board (refer to Test Setup paragraph), the luminaire can perform self-tests to help determine a faulty assembly. The self-tests are activated by setting the thumbwheel address to a corresponding self-test.

#### 3.1.1.2 Thumbwheel

The two least significant digits of the thumbwheel are defined as the test number. This number is used to select the required test. The most significant digit is defined as the parameter for the selected test. Not all tests have selectable parameters, but on those that do, it will alter an aspect of the test. For example, speed of oscillation during a movement test.



### 3.1.1.3 Seven-Segment Display

The seven-segment display is initially used to display the test number (in hexadecimal) for tests 1 thru 15. Error codes and results from these tests are then displayed whenever they occur. Mechanics tests, multiple function tests, and PSU test settings (tests 1 thru 15) all display their results as error codes that could be multiple during each test.

Error codes are all preceded by the characters “Er” and followed by three characters separated by decimal points. General error code format defines the first character as the faulty assembly by indicating the main assembly test number 1 thru F. The following two characters are the error type, that for the PSU test also incorporates the parameter setting on failure. Some error codes are followed by results that are preceded by a dash and are unique to that test. In general, they are an absolute value arising from that test, displayed in hexadecimal.

#### **Remember:**

- Characters are always separated by a decimal (dot).
- Lists of error codes are always separated by three scrolling bars before the start of the list is resrolled.
- Tests above number 15 only produce results unique to those tests.
- Scroll speeds of all displays are set by the scroll speed selectable with test 40, the error history display.

---

### 3.1.2 Reset Tests

The reset tests are carried out immediately upon power-up. They test the board ROM and RAM functionality. A failure is indicated by three solid parallel bars causing the software to terminate. The pan and tilt functions are then calibrated. Any errors detected here flag the offending mechanism as unavailable for future use. The relevant error code/result is displayed until further tests are selected. If no errors are discovered, then tests already selected on the thumbwheel will run.

#### **Detectable errors are as follows:**

- No encoder activity.
- Illegal encoder activity.
- Failure to reset to zero.

---

**Note:** The head should not be manually impeded while calibrating as this will upset the operation of future pan/tilt tests.

---

### 3.1.3 Mechanics Tests (Tests 1 Through 15)

The mechanics tests are composed of tests for the pan and tilt mechanisms and all bulkheads in the luminaire head. The mechanics oscillate at a speed selectable by the test parameter. While the oscillations are running, software checks the operation of position encoders (pan/tilt) or sensors where they exist. All mechanics tests can be used in the program mode (Test 30) to have user-programmable, multiple mechanics, operation.

---

#### 3.1.3.1 Pan/Tilt Tests (Tests 1 and 2)

**Detectable errors for pan/tilt assemblies are as follows:**

- Static encoder count + (result = encoder value).
- Unsequential bit count + (result = expected encoder value, actual encoder value). This error could indicate bits are tied high/low. (An error detected in pan/tilt mechanisms will halt that test.)

---

#### 3.1.3.2 Bulkhead Tests (Tests 3 Through 11)

**Detectable errors for the bulkhead are as follows:**

- Sensor hits too early.
- Backlash too small.
- Backlash too large + (result = backlash value).
- Sensor hit too late (sensor not hit within an additional 40 steps driven motion).
- Error stuck low.

---

**Note:** Two errors must be detected in a bulkhead before test halts.

---

#### 3.1.3.3 Simultaneous Tests (Tests 12 and 13)

Test 12 runs all mechanics tests in phase with each other (synchronized) and Test 13 allows them to free-run independently of each other (unsynchronized). The parameter setting controls the overall speed in each case. Error codes are displayed as they occur.

---

#### 3.1.3.4 PSU Test (Test 15)

The PSU test is used to operate the power supply and monitor the status lines. Once the lamp is powered up, you can exit the test without dousing the lamp. Errors will still be indicated for APS power supply while other tests run. On returning to this test, control can be resumed. The lamp will remain powered up unless a fault is detected. The parameter setting for this test drives the control lines of the APS power supply as shown in the summary table. All settings in this test will remain latched even when another test is selected. The resulting error codes are a combination of an

indication of this test (of the selected parameter) followed by the error. An "A" indication in the parameter section of the error code (not a selectable parameter value) indicates the error occurred during lamp power-up before it managed to power-up. Operation of this test is divided into four parts:

- Upon entry, three filters, dimming iris, and diffuser open. IPRESENT and HOT are checked. "F" appears on the display.
- LAMP-ON is applied and the four status lines monitored.
- Full intensity is applied and after approximately 4 sec. START is set. Once a constant IPRESENT level is sensed (lamp on) there is an 8 sec. warm up interval for the lamp. Within this period, intensity cannot be altered, but the lamp may be doused (parameter = 0). Also, the state of IPRESENT is represented on the display by either "0" or "1."
- "F" reappears on the display and other tests may be chosen.

If an error is detected in any of these four stages, then all control lines are negated and the relevant error(s) is displayed.

---

### 3.1.4 Manual Tests

The manual tests do not generate error codes. The tests do not generate movement, but allow analysis by software from a manual stimulus of the respective assembly. These tests may not be used in program mode

---

#### 3.1.4.1 PSU Control Test (Test 20)

The PSU control test duplicates PSU control just as Test 15. The difference is that Test 20 is not "intelligent" and does not douse the power supply on detecting errors. It is also not a simultaneous test. Feedback signals in this test are displayed real time in a serial fashion. The display order follows the sequence: IPRESENT, PSOT, HOT, SHORT. Control lines that latch within this test are indicated in Table 5.

---

#### 3.1.4.2 Sensor Test (Test 21)

The sensor test reads the state of a sensor. The parameter setting determines which sensor is chosen. A flashing switch symbol and conversely a hard on signal indicates a closed (detected) sensor.

---

#### 3.1.4.3 Encoder Test (Tests 22 and 23)

The encoder test displays the value of a selected encoder. The option is available to display a particular digit real time or a three-digit snapshot.

---

#### 3.1.4.4 Form and Function Test (Test 24)

The form and function test setting displays switch status in real time hexadecimal, which for a VL4 luminaire, at present, is 9 (hex).

---

### 3.1.4.5 Data Loop-Back Test (Test 25)

The data line test requires an external link between broadcast and reply lines if the parameter setting is set to 9. On parameter setting 8, the test will loop back via board relay. A valid loop is indicated by a chasing single segment circle. Receive and transmit errors are represented by "r" and "t", respectively, on the display. A transmit error will occur if the MPCC fails to receive a clock from the Manchester encoder. A receive error will occur if the MPCC fails to receive a transmitted data package.

---

### 3.1.5 Program Modes (Tests 30 Through 39)

The purpose of the program mode is to provide the facility for operating any choice of mechanisms at individually selected speeds. The selected mechanisms, with their respective speeds, may then be assigned to a thumbwheel setting in the range 31 thru 39. These programmed selections remain valid so long as the test EPROMs are not removed (not corrupted on power down/up).

The program mode is entered via thumbwheel setting 30. Once entered, the program mode is indicated by a "P." Tests are now selected or deselected on a toggle basis. Indication or selection is twofold - the test can be visibly seen to start and the test number is indicated on the display. Deselection is indicated by the test stopping and the test number on the display flashing. Only tests 1 thru 11 are valid in this mode. An illegal test number is indicated by "P" reappearing on the display. The program mode is exited by selecting a program save channel, numbers 31 thru 39. "PR" appears on the display and test continue to run in the mode now selectable by the parameter digit (synchronized or unsynchronized). Error codes are indicated for all the tests running since the program was exited. Errors detected before saving the program mode are cleared, but do go to the error history list. The save channel number can now be left to return to running test in manual mode. On return to that number, the preprogrammed test sequence can be resumed. Error codes indicated will be those encountered since the rerun of that program.

---

### 3.1.6 Error History (Tests 40 and 41)

The error history retains a finite list of all error codes produced since the test EPROMs were inserted or the list has been cleared. Approximately 120 errors may be saved before the store is considered full. At this point, the list is cleared. The error history is displayed by accessing test number 40. The list is cleared by accessing test number 41. Test results are not saved to the history list.

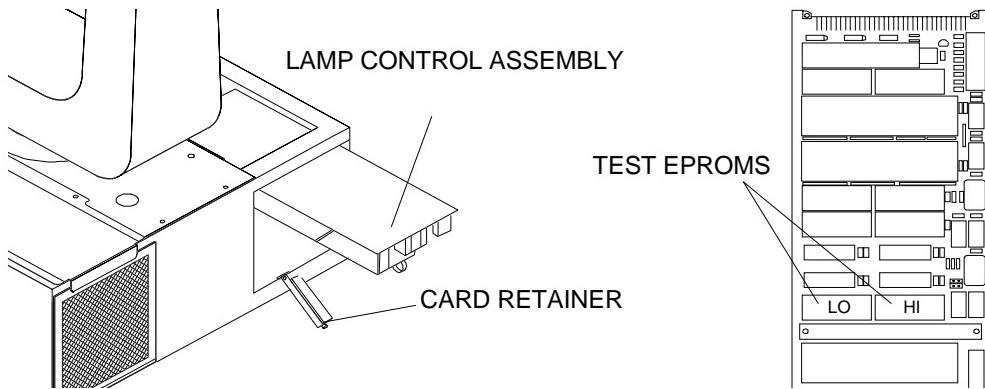
### 3.1.7    **Thumbwheel Test Program Bug**

A bug exists in thumbwheel test 88. To exit thumbwheel test, the test procedure instructs you to set thumbwheel to "000." If you set any two digits to "0" and punch the third digit, you may exit the thumbwheel test, either on first punch or on second punch. The most likely explanation for this problem is that the processor sees that third digit when the thumbwheel is between digits, so that as you punch the third digit, the processor sees "000" and exits the test.

### 3.1.8 Test Setup

#### To install test EPROMs and test luminaire:

- Step 1. Remove luminaire from system installation.
- Step 2. Remove lamp control assembly.
  - a. At right chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filter.
  - b. Remove four 6-32x5/16"PPB screws that secure right top cover to chassis and remove cover.
  - c. At card retainer, press down on spring release and open retainer. Remove lamp control assembly.



- Step 3. Install test EPROMs.
  - a. At universal control board, using IC extractor tool, remove system EPROMs.
  - b. Install HI and LO self-test EPROMs.
    1. HI EPROM (87.7137.0001).
    2. LO EPROM (87.7137.0002).

Step 4. Re-install lamp control assembly. Close chassis lid.

Step 5. Set thumbwheel address to 000.

**Note:** Power is immediately sent to luminaire when cheater cable is connected. Do not connect cheater cable to luminaire until ready to perform tests.

- Step 6. Obtain cheater cable (local 3-pin power connector on one end and a 9-pin CPC connector on the other) to supply power to luminaire. Connect 9-pin CPC of cheater cable to **Series 200** connector at luminaire chassis. Luminaire should calibrate and then stop.
- Step 7. Set thumbwheel to desired test. Refer to Test Results Charts section.

### 3.1.9 Test Results Charts

Tables 3-2 through 3-9 contain a symptom/probable cause/corrective action troubleshooting table that isolates faults to the major subassemblies. Table 3-1 isolates a general luminaire fault to a subassembly. After using Table 3-1, use Table 3-2 to isolate further.

**Table 3-1. Reset Tests (Automatic Tests on Pan and Tilt No Selectable)**

Test	Parameter	Error Codes		Results
Pan	None	101	No data activity error	
		102	Data activity error	
		103	No reset error	
Tilt	None	201	No data error activity	
		202	Data activity error	
		203	No reset error	

**Table 3-2. Mechanics Tests**

Test	Parameter	Error Codes		Results
1	Pan	9	End stop	104 Count does not change Display count last seen.
		8	End stop	105 Bit count is not sequential. Display received and expected count.
		7	Speed 1	
		6	Speed 2	
		5	Speed 3	
		4	Speed 4	
		3	Speed 5	
		2	Speed 6	
		1	Speed 7	
		0	Speed 8	
2	Tilt	9	End stop	201 Count does not change Display count received
		8	End stop	205 Bit count is not sequential. Display count received and expected count.
		7	Speed 1	
		6	Speed 2	
		5	Speed 3	
		4	Speed 4	
		3	Speed 5	
		2	Speed 6	
		1	Speed 7	
		0	Speed 8	

**Table 3-2. Mechanics Tests (continued)**

Test		Parameter		Error Codes		Results
3	Beam	9	End stop			
		8	End stop			
		7	Speed 1			
		6	Speed 2			
		5	Speed 3			
		4	Speed 4			
		3	Speed 5			
		2	Speed 6			
		1	Speed 7			
		0	Speed 8			
4	Edge	9	End stop	411	Sensor hit too early, motion impeded.	
		8	End stop	412	Backlash too small (0)	
		7	Speed 1	413	Backlash too large	Indicate backlash value (half steps in hexadecimal).
		6	Speed 2	414	Sensor not hit, motion impeded, sensor permanently high	
		5	Speed 3	415	Sensor permanently low	
		4	Speed 4			
		3	Speed 5			
		2	Speed 6			
		1	Speed 7			
		0	Speed 8			
5	Intensity	9	End stop	511	Sensor hit too early, motion impeded.	
		8	End stop	512	Backlash too small (0).	
		7	Speed 1	513	Backlash too large.	Indicate backlash value (half steps in hexadecimal).
		6	Speed 2	514	Sensor not hit, motion impeded, sensor permanently high	
		5	Speed 3	515	Sensor permanently low.	
		4	Speed 4			
		3	Speed 5			
		2	Speed 6			

**Table 3-2. Mechanics Tests (continued)**

Test		Parameter		Error Codes		Results
	Intensity	1	Speed 7			
		0	Speed 8			
6	Color 1	9	End stop	611	Sensor hit too early, motion impeded.	
		8	End stop	612	Backlash too small (0).	
		7	Speed 1	613	Backlash too large.	Indicate backlash value (half steps in hexadecimal).
		6	Speed 2	614	Sensor not hit, motion impeded, sensor permanently high	
		5	Speed 3	615	Sensor permanently low.	
		4	Speed 4			
		3	Speed 5			
		2	Speed 6			
		1	Speed 7			
		0	Speed 8			
7	Color 2	9	End stop	711	Sensor hit too early, motion impeded.	
		8	End stop	712	Backlash too small (0).	
		7	Speed 1	713	Backlash too large.	Indicate backlash value (half steps in hexadecimal).
		6	Speed 2	714	Sensor not hit, motion impeded, sensor permanently high	
		5	Speed 3	715	Sensor permanently low.	
		4	Speed 4			
		3	Speed 5			
		2	Speed 6			
		1	Speed 7			
		0	Speed 8			
8	Color 3	9	End stop	811	Sensor hit too early, motion impeded.	
		8	End stop	812	Backlash too small (0).	

**Table 3-2. Mechanics Tests (continued)**

<b>Test</b>	<b>Parameter</b>	<b>Error Codes</b>			<b>Results</b>
Color 3	7	Speed 1	813	Backlash too large.	Indicate backlash value (half steps in hexadecimal).
	6	Speed 2	814	Sensor not hit, motion impeded, sensor permanently high	
	5	Speed 3	815	Sensor permanently low.	
	4	Speed 4			
	3	Speed 5			
	2	Speed 6			
	1	Speed 7			
	0	Speed 8			
9	Gobo 1	Null			
10	Gobo 2	Null			
11	Douser	9	End stop		
		8	End stop		
		7	Speed 1		
		6	Speed 2		
		5	Speed 3		
		4	Speed 4		
		3	Speed 5		
		2	Speed 6		
		1	Speed 7		
		0	Speed 8		
12	All mechanics synchronized	9	End stop	Error codes as for all other tests.	
		8	End stop		
		7	Speed 1		
		6	Speed 2		
		5	Speed 3		
		4	Speed 4		
		3	Speed 5		
		2	Speed 6		
		1	Speed 7		
		0	Speed 8		

**Table 3-2. Mechanics Tests (continued)**

<b>Test</b>		<b>Parameter</b>		<b>Error Codes</b>		<b>Results</b>
13	All mechanics unsynchro-nized	9	End stop	Error codes as for all other tests.		
		8	End stop			
		7	Speed 1			
		6	Speed 2			
		5	Speed 3			
		4	Speed 4			
		3	Speed 5			
		2	Speed 6			
		1	Speed 7			
		0	Speed 8			

**Table 3-3. PSU Tests (Simultaneous by Default)**

<b>Test</b>		<b>Parameter</b>			<b>Results</b>	
15	PSU test	9	Lamp on		F01	IPRES at quiescent
		8	Lamp on and start and intensity at 100 percent		F03	HOT at quiescent
		7	Lamp on and start and intensity at 90 percent		F91	IPRES with lamp on signal only
		6	Lamp on and start and intensity at 80 percent		F92	PSOT with lamp on signal only.
		5	Lamp on and start and intensity at 70 percent		F93	HOT with lamp on signal only.
		4	Lamp on and start and intensity at 65 percent		F94	SHORT with lamp on signal only.
		3	Lamp on and start and intensity at 60 percent		FA2	PSOT while striking.
		2	Lamp on and start and intensity at 55 percent		FA3	HOT while striking.
		1	Lamp on and start and intensity at 50 percent		FA4	SHORT while striking.
		0	Douse		F82 to F12	PSOT while bulb struck.
					F83 to F13	HOT while bulb struck.
					F84 to F14	SHORT while bulb struck.
					F85 to F15	No IPRES while bulb struck.

**Table 3-4. Manual Tests**

<b>Test</b>		<b>Parameter</b>		<b>Results</b>
20	PSU control	9	Lamp on (latching).	Scroll status of IPRES, PSOT., HOT, and SHORT.
		8	Start (latching).	
		7	Lamp on and start and intensity at 100 percent (latching).	
		6	Lamp on and start and intensity at 100 percent.	
		5	Lamp on and start and intensity at 90 percent.	
		4	Lamp on and start and intensity at 80 percent.	
		3	Lamp on and start and intensity at 70 percent.	
		2	Lamp on and start and intensity at 60 percent.	
		1	Lamp on and start and intensity at 50 percent.	
		0	Douse (latching).	
21	EOT sensors	8	Read color 3 sensor.	Display character for closure, flashing character for open.
		7	Read color 2 sensor.	Display character for closure, flashing character for open.
		6	Read color 1 sensor.	Display character for closure, flashing character for open.
		5	Select intensity iris sensor.	Display character for closure, flashing character for open.
		4	Select edge sensor.	Display character for closure, flashing character for open.
22	Pan encoder	9	Select MSD.	Display digit.
	Pan encoder	8	Select MSD.	Display digit.
	Pan encoder	7	Select MSD.	Display digit.
	Pan encoder	6	Select snapshot.	Scroll digits.
23	Tilt encoder	9	Select MSD.	Display digit.
		8	Select MSD.	Display digit.
		7	Select MSD.	Display digit.
		6	Select snapshot.	Scroll digits.

**Table 3-4. Manual Tests (continued)**

<b>Test</b>		<b>Parameter</b>		<b>Results</b>
24	Form and function			
25	Data loop-back	9	External loop-back (relay open and link required).	Loop-back successful = 0 (chasing)
		8	Internal loop-back (relay closed).	Transmit error = t
88	Thumbwheel test		Select 000 to exit test.	display character last changed on thumbwheel.

**Table 3-5. Program Mode Selection**

<b>Test</b>		<b>Parameter</b>		<b>Results</b>
30	Enter program mode		None	Indication of test number for selection, flashing number for deselection, or "P" if invalid test number.
31	Program mode exit, save and run program	9	Synchronized mode.	Error code displays during that session.
		8	Unsynchronized mode.	
32 to 39	Same as above.		Same as above.	Same as above.

**Table 3-6. Error History Selection**

<b>Test</b>		<b>Parameter</b>		<b>Results</b>
40	Enter code history	9	View error history since clearing. Select scroll speed.	Three character error codes are displayed sequentially.
41	Clear error code history.		Error code history is cleared	Scrolling "parallel bars."

**Table 3-7. General Test Brief Summary Numbers**

<b>Test Selection Number</b>	<b>Title</b>	<b>Display Character for Error Codes Commencement</b>
1	Pan	1
2	Tilt	2
3	Beam	3
4	Edge	4
5	Intensity	5
6	Color 1	6
7	Color 2	7
8	Color 3	8
9	Null	9
10	Null	A
11	Douser	b
12	All mechanics synchronized	C
13	All mechanics unsynchronized	d
15	PSU test	
20	PSU control	
21	EOT sensors	
22	Pan encoder	
23	Tilt encoder	
24	Form and function	
25	Data loop-back	
88	Thumbwheel	
30	Enter program mode	
31 to 39	Program mode exit, save, and run program	
40	Error history display	
41	Clear error history	

**Table 3-8. General Parameter Summary**

<b>Parameter</b>	<b>Mechanics (1 to 11)</b>	<b>PSU Test (15)</b>	<b>PSU Control</b>	<b>EOT Sensors Test (21)</b>	<b>Pan/Tilt Encoder Tests (22, 23)</b>	<b>Loop-Back Test</b>
9	End stop	Lamp on	Lamp on		Select MSD	External loop-back (relay open)
8	End stop	Lamp on and start on and intensity at 100 percent	Start	Select color 3 sensor	Select NSD	Internal loop-back (relay closed)
7	Speed 1	Intensity at 90 percent	Lamp on and start on and intensity at 100 percent	Select color 2 sensor	Select LSD	
6	Speed 2	Intensity at 80 percent	Intensity at 90 percent	Select color 1 sensor		
5	Speed 3	Intensity at 70 percent	Intensity at 90 percent	Select Intensity iris sensor		
4	Speed 4	Intensity at 65 percent	Intensity at 80 percent	Select edge sensor		
3	Speed 5	Intensity at 60 percent	Intensity at 70 percent			
2	Speed 6	Intensity at 55 percent	Intensity at 60 percent			
1	Speed 7	Intensity at 50 percent	Intensity at 50 percent			
0	Speed 8	Douse	Douse			

**Table 3-9 General Error Codes**

Error Number	Error for PSU Test (15) MSC = F NSC = Parameter LDC = Error Number	Error for Mechanics Tests (1 to 11) MSC = Test Number NSC + LSC = Error Number	Results Associated With Mechanics Error Codes (After Error Code)
01	IPRES	No data activity error	
02	PSOT	Data activity error	
03	HOT	No reset error	
04	SHORT	Count does not change	Display count last seen
05	NOT IPRES	Bit count is not sequential	Display received and expected count
11		Sensor hit too early, motion impeded	
12		Backlash too small (0)	
13		Backlash too large.	Indicate backlash value (half steps in hexadecimal)
14		Sensor not hit, motion impeded, sensor permanently high	
15		Sensor permanently low	

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## 3.2 Luminaire Fault Isolation

### 3.2.1 Luminaire Fault Isolation Chart

Assuming that all other system components are working properly and that proper system power has been supplied to the luminaire:

Symptom	Probable Cause	Corrective Action
Luminaire powers up, but will not calibrate	Bad UCB Bad LVS Bad bridge rectifier Bad transformer	para. 3.2.2.1
Luminaire calibrates, but will not come on line	Input connector pins pushed in Loose UCB connection Bad UCB	para. 3.2.2.2
Luminaire has no power	Input connector pins pushed in Blown VSB 3A fuse Bad VSB	para. 3.2.2.3
Luminaire powers up, but recalibrates repeatedly	Loose YTB/MBD connection Bad pan or tilt mechanism Bad LVS Bad UCB	para. 3.2.2.4
Lamp will not start	Bad lamp Bad APS Bad UCB Bad ignitor board or lamp wires	para. 3.2.2.5
Douser not working properly	Loose connection at YTB Bad UCB Dashpots out of adjustment Loose or missing douser spring Damaged douser leaves Damaged ring washers Damaged ring Bad solenoid	para. 3.2.2.6
Dimmer iris not working properly	Loose connection at YTB Bad UCB Damaged iris leaves Bad sensor Loose/broken belt Incorrect washer/spacer stacking	para. 3.2.2.7
Diffuser not working properly	Loose connection at YTB Bad UCB Broken diffuser glass Bad sensor or motor Loose/broken belt	para. 3.2.2.8

## Luminaire Fault Isolation Chart (continued)

Assuming that all other system components are working properly and that proper system power has been supplied to the luminaire:

Symptom	Probable Cause	Corrective Action
Magenta filters not working properly	Loose connection at YTB Bad UCB Bad worm or spur gear Incorrect washer/spacer stacking Bad motor Broken glass Bad sensor Bad yoke termination board	para. 3.2.2.9
Amber filters not working properly	Loose connection at YTB Bad UCB Bad worm or spur gear Bad motor Broken glass Bad sensor Gears/carriers not “free floating” in bushings Bad yoke termination board	para. 3.2.2.10
Blue filters not working properly	Loose connection at YTB Bad UCB Bad worm or spur gear Bad motor Broken glass Broken drive shaft Bad yoke termination board	para. 3.2.2.11
Improper tilt response	MTA connector unplugged at MBD Bad tilt mechanism Bad UCB Bad LVS Bad yoke cable	para. 3.2.2.12
Improper pan response	Bad UCB Bad LVS Loose/broken belt MTA connector unplugged at MBD Bad driven pulley Bad motor	para. 3.2.2.13

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## 3.2.2 Luminaires Fault Isolation Procedures

### 3.2.2.1 Luminaires Powers Up, But Will Not Calibrate

Assuming the following:

- Console is powered up and working properly.
- Repeater unit is properly connected and working.
- Lamp cable is good.

Step 1. At VL4 lamp input connector, check for pushed in pins. Repair as needed. Ensure that CPC connector is properly connected.

Step 2. Hard reset luminaire by removing and then resupplying power to unit.

Step 3. With power applied to luminaire, check UCB seven segment display.

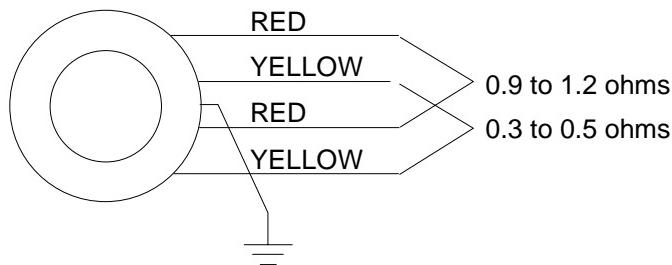
- a. Verify that decimal point is flashing in display. If not flashing or if character “8” is appears, then replace UCB and retest. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph. Wait at least 60 seconds for luminaire calibration.
- b. If symptom persists, replace LVS and retest. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.

Step 4. Check transformer and bridge rectifiers.

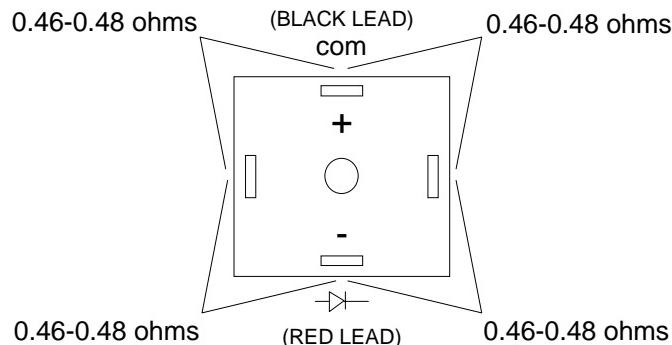
a. Remove UCB and LVS. At motherboard, unplug connector at P8. Using voltmeter, verify proper voltages at transformer as follows:

- 1) Set voltmeter to DC.
- 2) Apply power to luminaire.
- 3) Place black probe of voltmeter in P4 of transformer connector (GND).
- 4) At motherboard, place red probe on each of following pins to verify voltages.  
P8 - 1 = +10 - 20 VDC  
P8 - 2 = +35 - 45 VDC  
P8 - 3 = +35 - 45 VDC

- b. Disconnect Faston connectors from bridge rectifiers. Using voltmeter, meter transformer secondaries as follows:



- c. Replace transformer as needed. Refer to Transformer Removal and Replacement paragraph.
- d. Using voltmeter, meter bridge rectifiers as follows:



- e. Replace bridge rectifiers as needed.

### **3.2.2.2 Luminaire Calibrates, But Will Not Come On-Line**

Assuming the following:

- Console is powered up and working properly.
- Repeater unit is properly connected and working.
- Lamp cable is good.

Step 1. At VL4 lamp input connector, check for pushed in data pins (gold pins 2 thru 6). Repair as needed. Ensure that CPC connector is properly connected.

Step 2. Hard reset luminaire by removing and then resupplying power to unit.

Step 3. Remove power to luminaire and check motherboard connections.

Step 4. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.

---

**3.2.2.3 Luminaires Has No Power**

Assuming the following:

- Repeater unit is properly connected and working.
- Lamp cable is good.

Step 1. Inspect VL4 lamp input connector.

- a. Check connection to lamp run cable. Ensure good connection.
- b. Check condition of input connector. Replace connector or pins as needed. Refer to Input Connector Removal and Replacement paragraph.

Step 2. At VSB, check for blown fuses.

- a. Replace VSB 3A fuses as necessary. Refer to Voltage Selector PCB Fuses Removal and Replacement paragraph.
- b. Replace VSB. Refer to Voltage Selector PCB Removal and Replacement paragraph.

---

**3.2.2.4 Luminaires Powers Up, But Recalibrates Repeatedly**

- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
- Step 2. At motherboard, ensure all connectors are properly and securely connected.
- Step 3. Replace tilt mechanism. Refer to Tilt Mechanism Removal and Replacement paragraph.
- Step 4. Replace pan mechanism. Refer to Pan Mechanism Removal and Replacement paragraph.
- Step 5. Replace LVS. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 6. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.

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### 3.2.2.5 Lamp Will Not Start

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**CAUTION:** Do not touch glass envelope of lamp with bare fingers. Oils on fingers will deteriorate glass when heated and may cause glass to explode.

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- Step 1. Inspect lamp.
    - a. At rear of luminaire head, at lamp assembly, turn 1/4-turn fasteners and carefully slide out lamp assembly from luminaire head.
    - b. At lamp carriage, squeeze and lift lamp retainer. Remove lamp from lamp carriage. Replace as needed. Refer to Lamp Removal and Replacement paragraph.
  - Step 2. Replace power supply. Refer to Arc Power Supply Removal and Replacement paragraph.
  - Step 3. Replace ignitor board. Refer to Ignitor Board Removal and Replacement paragraph.
  - Step 4. Inspect and test lamp wires. Replace as needed. Refer to Yoke Cables and Lamp Wire Removal and Replacement paragraph.
- 

### 3.2.2.6 Douser Not Working Properly

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- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
  - Step 2. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
  - Step 3. Remove Dimmer/Filter/Douser assembly. Refer to Dimmer/Filter/Douser Assembly Removal and Replacement paragraph.
    - a. Recalibrate dashpots. Refer to Douser Dashpot Calibration paragraph.
    - b. Inspect douser springs. Ensure springs are properly connected and not worn or stretched. Replace as needed. Refer to Douser Spring Removal and Replacement paragraph.
- 

**CAUTION:** Wear white cotton gloves when working with iris leaves. Oils and dirt from hands will damage douser leaves!

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- c. Inspect douser leaves. Ensure that leaves are not bent and that leaf pins are not smashed or otherwise damaged. Replace as needed. Refer to Douser Leaves Removal and Replacement paragraph.

- d. Inspect ring washers. Ensure that plastic washers and rollers are correctly installed. Refer to Douser Leaves Removal and Replacement paragraph.
  - e. Inspect ring. Ensure that ring is not bent, dented, or otherwise damaged. Replace as needed. Refer to Douser Leaves Removal and Replacement paragraph.
- Step 4. Replace solenoid assembly. Refer to Dimmer/Filter/Douser Solenoid Assembly Removal and Replacement paragraph.

---

### **3.2.2.7 Dimmer Iris Not Working Properly**

- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
- Step 2. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 3. Remove Dimmer/Filter/Douser assembly. Refer to Dimmer/Filter/Douser Assembly Removal and Replacement paragraph.

---

**CAUTION:** Wear white cotton gloves when working with douser leaves. Oils and dirt from hands will damage douser leaves!

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- a. Inspect dimmer leaves. Ensure that leaves are not bent and that leaf pins are not smashed or otherwise damaged. Replace as needed. Refer to Dimmer Leaves Removal and Replacement paragraph.
  - b. Inspect washer/spacer stacking. Ensure that washers/spacers are in correct order (different for left and right leaves). Refer to Dimmer Leaves Removal and Replacement paragraph.
  - c. Inspect dimmer belt. Ensure that belt is not loose or damaged. Replace as needed. Refer to Dimmer Belt Removal and Replacement paragraph.
- Step 4. Replace sub-micro switch (sensor). Refer to Dimmer Sub-Micro Switch Removal and Replacement paragraph.
- Step 5. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.

### **3.2.2.8 Diffuser Not Working Properly**

- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
  - Step 2. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
  - Step 3. Remove diffuser mechanism. Refer to Diffuser Mechanism Removal and Replacement paragraph.
    - a. Check for broken or damaged panels. Replace diffuser mechanism as needed or refer to Diffuser Panel Emergency Fix paragraph.
    - b. Check for loose or damaged belt. Replace diffuser mechanism as needed.
  - Step 4. Replace diffuser assembly sensor. Refer to Diffuser Sensor Removal and Replacement paragraph.
  - Step 5. Replace diffuser mechanism motor. Refer to Diffuser Motor Removal and Replacement paragraph.
  - Step 6. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- 

### **3.2.2.9 Magenta Filters Not Working Properly**

- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
  - a. One 4-pin connector at header marked YTB-P11.
  - b. One 8-pin connector at header marked YTB-P10.
  - c. Two 26-pin black yoke cable connectors at 26-pin headers.
- Step 2. At yoke termination board, swap magenta connectors with another color and see if symptom occurs with other filters.
- Step 3. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 4. Remove Dimmer/Filter/Douser assembly. Refer to Dimmer/Filter/Douser Assembly Removal and Replacement paragraph.
  - a. Inspect worm wheel. Ensure that wheel is not damaged and that it is securely attached to motor shaft. Replace worm wheel as needed. Refer to Magenta Motor Worm Wheel and Spur Gear Removal and Replacement paragraph.

- b. Inspect spur gear. Ensure that teeth are not stripped or otherwise damaged. Replace as needed. Refer to Magenta Motor Worm Wheel and Spur Gear Removal and Replacement paragraph.
  - c. Inspect washer/spacer stacking. Ensure that washers/spacers are in correct order.
  - d. Inspect magenta filters. Ensure that they are not damaged or broken. Replace bulkhead as needed.
- Step 5. Replace motor. Refer to Magenta Stepper Motor Removal and Replacement paragraph.
- Step 6. Replace sensor. Refer to Dimmer/Filter/Douser Sensor Removal and Replacement paragraph.
- Step 7. Replace yoke termination board. Refer to Yoke Termination Board Removal and Replacement paragraph.

---

### 3.2.2.10 Amber Filters Not Working Properly

- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
  - a. One 4-pin connector at header marked YTB-P9.
  - b. One 8-pin connector at header marked YTB-P8.
  - c. Two 26-pin black yoke cable connectors at 26-pin headers.
- Step 2. At yoke termination board, swap amber connectors with another color and see if symptom occurs with other filters.
- Step 3. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 4. Remove Blue/Amber bulkhead. Refer to Blue/Amber Bulkhead Removal and Replacement paragraph.
  - a. Inspect worm wheel. Ensure that wheel is not damaged and that it is securely attached to motor shaft. Replace worm wheel as needed. Refer to Blue/Amber Bulkhead Worm Wheel Removal and Replacement paragraph.
  - b. Inspect spur gear. Ensure that teeth are not stripped or otherwise damaged. Replace as needed.
  - c. Inspect washer/spacer stacking. Ensure that washers/spacers are in correct order.
  - d. Inspect amber filters. Ensure that they are not damaged or broken. Ensure that all filter carriers are “free floating” in gears. Replace bulkhead as needed.

- Step 5. Replace motor. Refer to Blue/Amber Bulkhead Stepper Motor Removal and Replacement paragraph.
- Step 6. Replace sensor. Refer to Blue/Amber Bulkhead Sensor Removal and Replacement paragraph.
- Step 7. Replace yoke termination board. Refer to Yoke Termination Board Removal and Replacement paragraph.

---

### 3.2.2.11 Blue Filters Not Working Properly

- Step 1. At yoke termination board, check connections. Ensure all connectors are properly and securely connected.
  - a. 4-pin connector from header marked YTB-P7.
  - b. 8-pin connector from header marked YTB-P6.
  - c. Two 26-pin black yoke cable connectors at 26-pin headers.
- Step 2. At yoke termination board, swap blue connectors with another color and see if symptom occurs with other filters.
- Step 3. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 4. Remove Blue/Amber bulkhead. Refer to Blue/Amber Bulkhead Removal and Replacement paragraph.
  - a. Inspect worm wheel. Ensure that wheel is not damaged and that it is securely attached to motor shaft. Replace worm wheel as needed. Refer to Blue/Amber Bulkhead Worm Wheel Removal and Replacement paragraph.
  - b. Inspect spur gear. Ensure that teeth are not stripped or otherwise damaged. Replace as needed.
  - c. Inspect washer/spacer stacking. Ensure that washers/spacers are in correct order.
  - d. Inspect blue filters. Ensure that they are not damaged or broken. Ensure that all filter carriers are “free floating” in gears. Replace bulkhead as needed.
- Step 5. Replace motor. Refer to Blue/Amber Bulkhead Stepper Motor Removal and Replacement paragraph.
- Step 6. Replace sensor. Refer to Blue/Amber Bulkhead Sensor Removal and Replacement paragraph.
- Step 7. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 8. Replace yoke termination board. Refer to Yoke Termination Board Removal and Replacement paragraph.

---

**3.2.2.12 Improper Tilt Response**

- Step 1. At yoke termination board, ensure proper connection.
    - a. 5-pin connector from TILT header marked YTB-P3.
    - b. 4-pin connector from TILT header marked YTB-P4.
  - Step 2. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
  - Step 3. Replace LVS. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
  - Step 4. Replace tilt mechanism. Refer to Tilt Mechanism Removal and Replacement paragraph.
  - Step 5. Replace yoke cables. Refer to Yoke Cables and Lamp Wire Removal and Replacement paragraph.
- 

**3.2.2.13 Improper Pan Response**

- Step 1. At motherboard, check MTA connection.
- Step 2. Replace UCB. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 3. Replace LVS. Refer to Low Voltage Supply and Universal Control PCB Removal and Replacement paragraph.
- Step 4. Access pan drive assembly. Refer to Pan Drive Assembly Removal and Replacement paragraph.
  - a. Check pan mechanism MTA connector. Ensure good connection.
  - b. Ensure that belt is not damaged or loose.
  - c. Ensure that driven pulley is not worn or damaged.
  - d. Replace pan drive assembly as needed.
- Step 5. Replace pan drive assembly

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## 3.3 Luminaire Maintenance Procedures

### 3.3.1 Blue/Amber Bulkhead Maintenance

#### 3.3.1.1 Blue/Amber Bulkhead Removal and Replacement

**Parts:**

1 EA ASSY, BLUE/AMBER BULKHEAD (VL4) (22.4006.0001)

**Tools:**

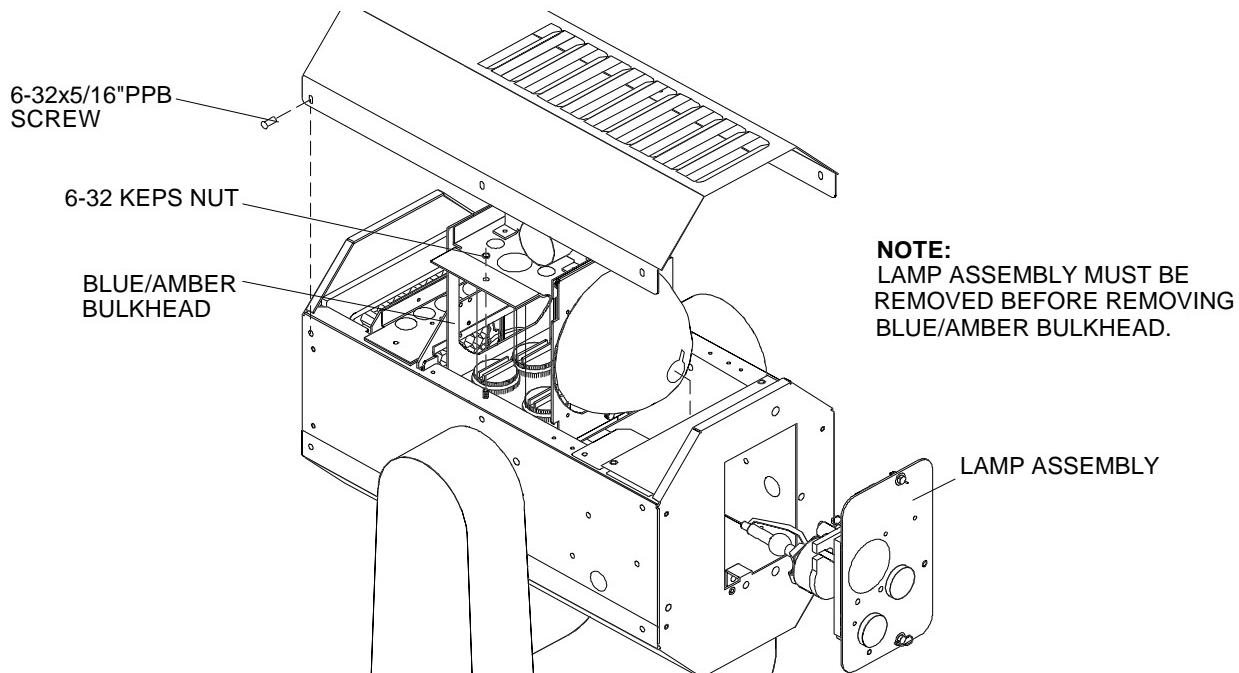
Screwdriver, Phillips #2

Nutdriver, 5/16 inch

**To remove and replace blue/amber bulkhead:**

Step 1. Remove power to luminaire.

Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).



**Figure 3-1. Blue/Amber Bulkhead Removal and Replacement**

- Step 3. At yoke termination board, disconnect blue/amber bulkhead connectors:
- 4-pin connector from AMBER header marked YTB-P9.
  - 8-pin connector from AMBER header marked YTB-P8.
  - 4-pin connector from BLUE header marked YTB-P7.
  - 8-pin connector from BLUE header marked YTB-P6.

Step 4. Remove lamp assembly from head.

- a. At lamp access plate, turn 1/4-turn fasteners to open lamp access plate and slide out lamp assembly.

---

**CAUTION:** When removing bulkhead, make sure that connectors do not get caught on yoke termination board.

---

Step 5. Remove blue/amber bulkhead.

- a. At blue/amber bulkhead, using 5/16 inch nutdriver, remove two 6-32 KEPS nuts that secure bulkhead to male studs on rail covers.

- b. Slide bulkhead out of luminaire head.

Step 6. Replace blue/amber bulkhead by doing Steps 2 thru 5 in reverse.

---

### 3.3.1.2 Blue/Amber Bulkhead Stepper Motor Removal and Replacement

**Parts:**

- 1 EA ASSY, MOTOR & MOUNT, BAB (22.9628.0240)  
2 EA CABLE TIE, SMALL .10X4" (55.2186.0001)

**Tools:**

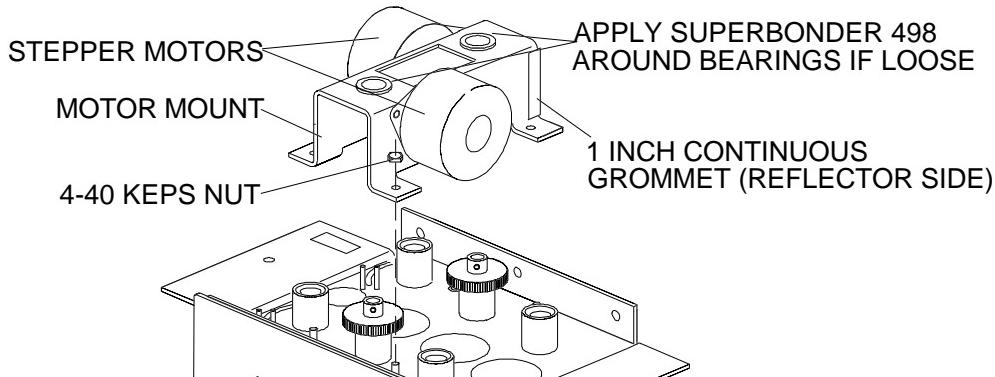
- Screwdriver, #1 Phillips  
Screwdriver, #2 Phillips  
Nutdriver, 5/16 inch  
Versilube  
Superbonder 498, as needed (06.6007.0498)

**To remove and replace Blue/Amber Bulkhead Stepper Motor:**

---

**Note:** The stepper motors currently manufactured have a larger bearing than older versions. The larger bearing does not fit the motor mount used on the blue/amber bulkhead. Since it is not possible to modify the motor mounting bracket outside of a shop, a repair assembly has been created with two new motors and a modified mounting bracket. The required MTA connectors and strain reliefs are part of the repair assembly.

- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination board, disconnect motor connectors:
  - a. 8-pin connector from AMBER header marked YTB-P8.
  - b. 8-pin connector from BLUE header marked YTB-P6.
- Step 4. Remove motor mount (with both motors).
  - a. At bulkhead corners, remove two cable ties securing motor wires to cable anchors. Also remove two cable ties placed on wires between cable anchors.
  - b. At motor mount, remove four 4-40 KEPS nuts that secure mount to bulkhead and remove mount (**Figure 3-2**).



**Figure 3-2. Blue/Amber Bulkhead Stepper Motor Removal and Replacement**

- Step 5. Install replacement motor assembly and re-install blue/amber bulkhead by doing Steps 2 thru 4 in reverse.
- a. Apply small amount of Versilube to both motor worm gears and make sure that worm wheels are aligned properly on drive shaft so that they engage worm gears in center.
  - b. If during replacement motor mount bushing or bearing comes loose, place bead of Superbonder 498 glue around bushing flange and fully reseat bushing in motor mount. Allow 15 minutes for glue to dry before re-installing motor mount.

---

### 3.3.1.3 Blue/Amber Bulkhead Sensor Removal and Replacement

**Parts:**

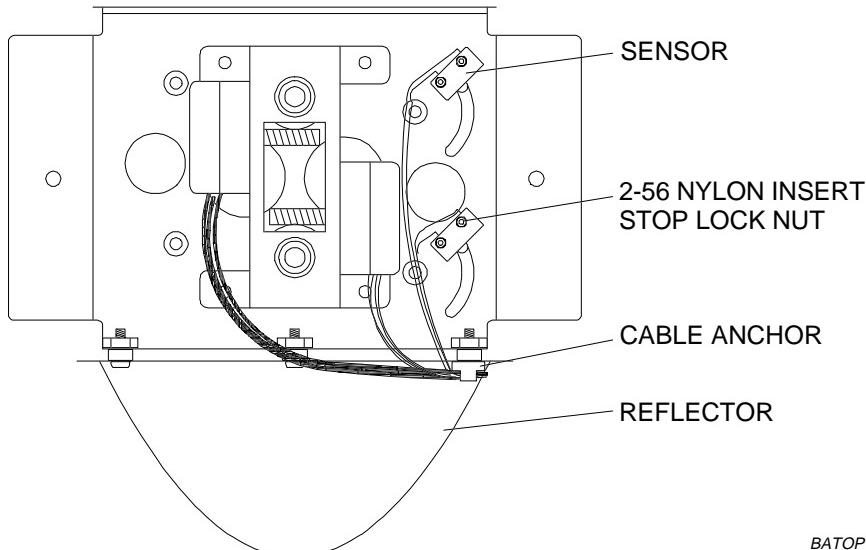
- |      |   |
|------|---|
| 1 EA | ASSY, MICROSWITCH WITH 24 AWG WIRES<br>(22.1023.0003)       |
| 1 EA | CONN HOUSING, MTA CLOSED END NATURAL 4PIN<br>(52.6300.0001) |
| 1 EA | COVER, STRAIN RELIEF/4 POS MTA (52.6424.0004)               |
| 2 EA | CABLE TIE, SMALL .10X4" (55.2186.0001)                      |

**Tools:**

- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- Pliers, needle-nosed
- Nutdriver, 1/4 inch
- Diagonal cutters
- MTA Crimper
- Fine point permanent ink marker

**To remove and replace blue/amber bulkhead sensor:**

- Step 1. Remove power to luminaire.
- Step 2. Remove blue/amber bulkhead (**Figure 3-1**).
- Step 3. Remove faulty sensor.
  - a. At bulkhead corners, remove two cable ties securing sensor wires to cable anchors (**Figure 3-3**).
  - b. Remove two cable ties placed on wires between cable anchors.
  - c. At faulty sensor, using 1/4 inch nutdriver, remove two 3-56 nylon insert stop lock nuts that secure sensor to threaded standoff and remove sensor.



**Figure 3-3. Blue/Amber Bulkhead Assembly Sensor Removal and Replacement**

Step 4. Prepare replacement sensor.

- a. At replacement sensor assembly, using needle-nosed pliers, bend unused sensor lead to 45 degree angle.
  - b. Trim sensor assembly wires to 15 inches.
- 
- CAUTION:** To avoid poor connections, do not reuse MTA connector from removed sensor on replacement sensor.
- c. Using MTA crimper, crimp wires into new 4-pin MTA connector using the following pinouts:

Pin	Wire
4	Blue
3	Blue
2	N/C
1	N/C

- d. Install strain relief cover on 4-pin connector. Using permanent ink marker, mark strain relief either BLUE or AMB as necessary.

---

**CAUTION:** Do not overtighten nuts when installing replacement sensor.

- e. Install replacement sensor and re-install blue/amber bulkhead by doing Steps 2 and 3 in reverse.

### 3.3.1.4 Blue/Amber Bulkhead Worm Wheel Removal and Replacement

**Parts:**

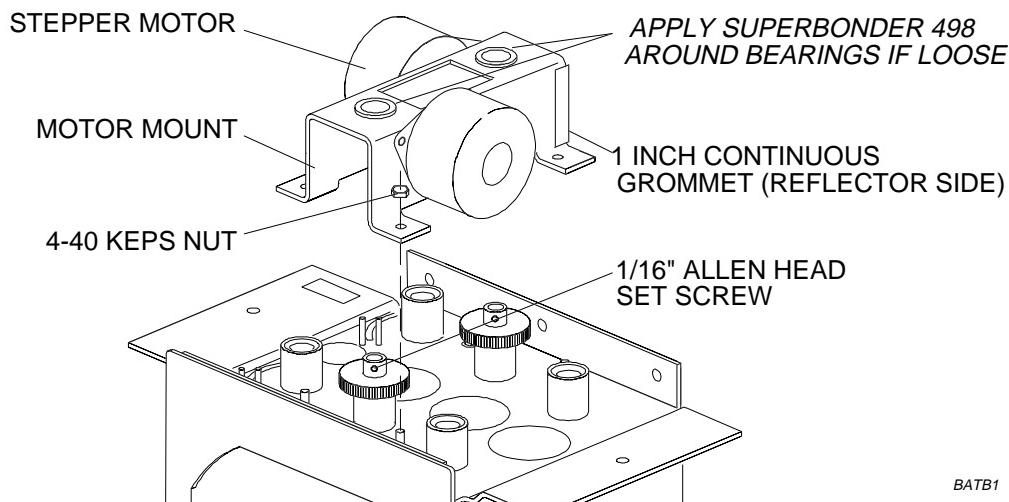
1 EA WORM WHEEL, MOLDED 48P 40T 3/16F 1/4"BOR  
(55.6570.0001) - Brown

**Tools:**

Screwdriver, Phillips #1  
Screwdriver, Phillips #2  
Nutdriver, 5/16 inch  
Diagonal cutters  
Wrench, Allen 1/16 inch  
Superbonder 498 (06.6007.0498)  
Versilube

**To remove and replace blue/amber bulkhead worm wheel:**

- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. Remove motor worm wheel.
  - a. At motor mount, remove four 4-40 KEPS nuts that secure mount to bulkhead and remove mount (**Figure 3-4**).
  - b. At damaged worm wheel, using 1/16 inch Allen wrench, loosen setscrew in damaged worm wheel and remove worm wheel from shaft.



**Figure 3-4. Blue/Amber Bulkhead Worm Wheel Removal and Replacement**

- Step 4. Install replacement worm wheel and re-assemble luminaire.
  - a. Replace worm wheel by doing Steps 2 and 3 in reverse.
  - b. Make sure that worm wheel is aligned properly on drive shaft so that it engages worm gear in center.
  - c. Apply small amount of Versilube to drive shaft.
  - d. If during replacement motor mount bushing or bearing comes loose, place bead of Superbonder 498 glue around bushing flange and fully reseat bushing in motor mount. Allow 15 minutes for glue to dry before re-installing motor mount.

### 3.3.2 Diffuser Mechanism Maintenance

#### 3.3.2.1 Diffuser Mechanism Removal and Replacement

**Parts:**

1 EA ASSY, DIFFUSER MECHANISM (VL4) (22.4003.0001)

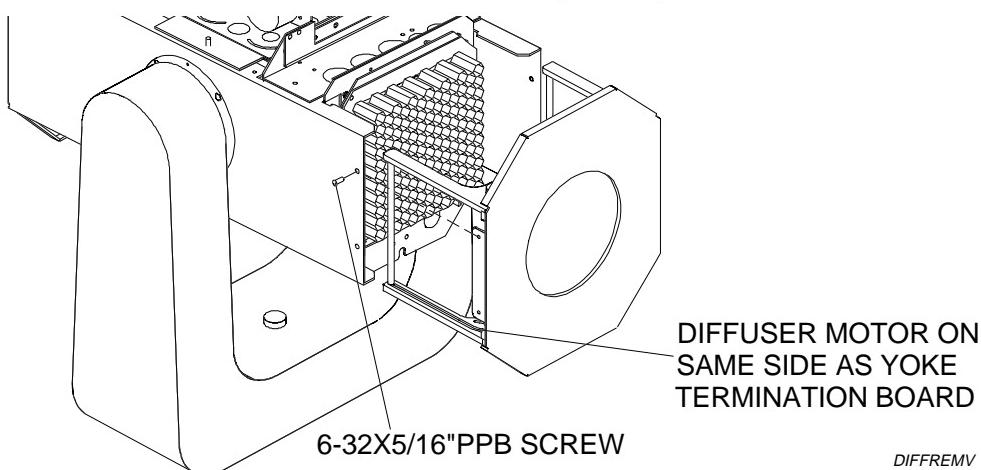
**Tools:**

Screwdriver, Phillips #2

Cutters, diagonal

**To remove and replace diffuser mechanism:**

- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination board, disconnect diffuser connectors.
  - a. 4-pin connector from header marked YTB-P15.
  - b. 8-pin connector from header marked YTB-P14.
- Step 4. Remove diffuser mechanism.
  - a. At front aperture rails, remove four 6-32x5/16"PPB screws that secure front aperture to rails (**Figure 3-5**).
  - b. Remove cable ties as necessary. Close diffuser.
  - c. Slide out front aperture plate with diffuser mechanism.



**Figure 3-5. Diffuser Mechanism Removal and Replacement**

- Step 5. Replace diffuser mechanism by doing Steps 2 thru 4 in reverse.
  - a. Ensure that diffuser mechanism is installed with motor and sensor wires on same side as yoke termination board.
  - b. Fit motor and sensor wires of diffuser mechanism to notch in dimmer/filter/douser bulkhead (adjacent to dimmer belt).

### 3.3.2.2 Diffuser Sensor Removal and Replacement

#### Parts:

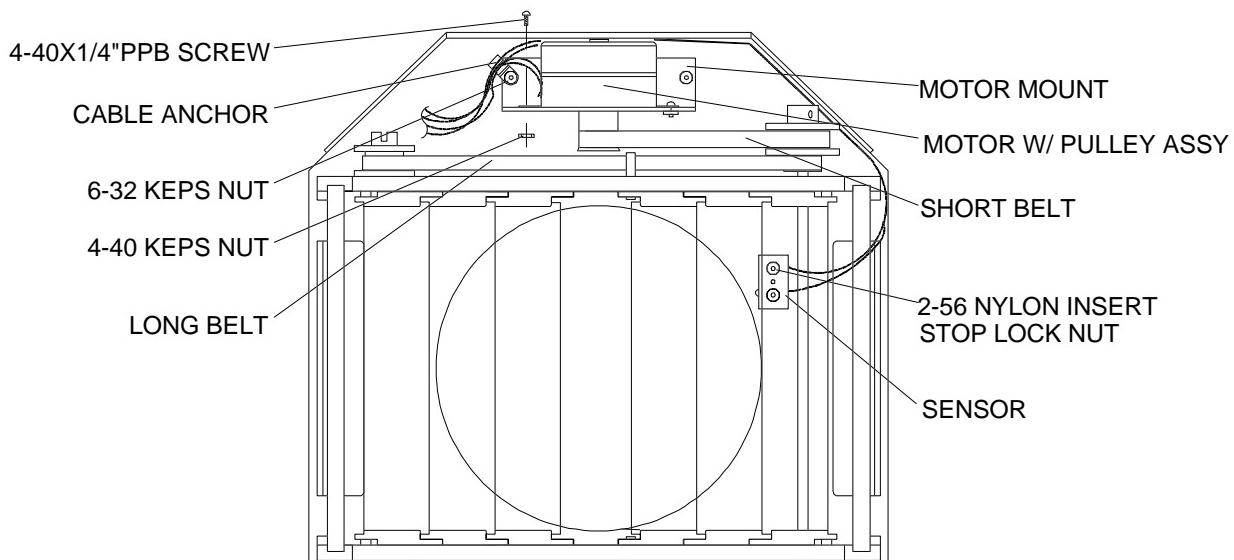
- 1 EA ASSY, MICROSWITCH WITH 24 AWG WIRES (22.1023.0003)
- 1 EA CONN HOUSING, MTA CLOSED END NATURAL 4PIN (52.6300.0001)
- 1 EA COVER, STRAIN RELIEF /4POS MTA (52.6424.0004)

#### Tools:

- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- Nutdriver, 1/4 inch
- Permanent marker, fine
- Diagonal cutters
- MTA Crimper
- Fine point permanent ink marker

#### To remove and replace diffuser assembly sensor:

- Step 1. Remove power to luminaire.
- Step 2. Remove diffuser mechanism (**Figure 3-5**).
- Step 3. Remove diffuser sensor.
  - a. Fully close diffuser.
  - b. At stepper motor mounting plate, using diagonal cutters, remove cable tie securing motor and sensor wires (**Figure 3-6**).



**Figure 3-6. Diffuser Mechanism Motor and Sensor Removal and Replacement**

---

**CAUTION:** Space for nutdriver is very limited, be careful not to break diffuser panel during procedure.

---

- c. Using 1/4 inch nutdriver, remove two 3-56 nylon insert stop lock nuts that secure sensor to threaded standoffs and remove sensor.

Step 4. Prepare and install replacement sensor.

- a. At replacement sensor assembly, using needle-nosed pliers, bend unused sensor lead to 45° angle.
- b. Trim sensor assembly wires to 21 inches.

---

**CAUTION:** To avoid poor connections, do not reuse MTA connector from removed sensor on replacement sensor.

---

- c. Using MTA crimper, crimp wires into new 4-pin MTA connector using the following pinouts:

Pin	Wire
4	Blue
3	Blue
2	N/C
1	N/C

- d. Install strain relief cover on 4-pin connector. Using permanent ink marker, mark strain relief DIFF.

---

**Note:** During installation of sensor, make sure that sensor switch is installed with microswitch pointing toward diffuser opening.

---

- e. Install replacement sensor and re-install diffuser mechanism by doing Steps 2 thru 5 in reverse.

---

### 3.3.2.3 Diffuser Motor Removal and Replacement

**Parts:**

1 EA ASSY, MOTOR W/PULLEY (DIF4) (22.5001.0000)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Cutters, diagonal

**To remove and replace diffuser mechanism motor:**

- Step 1. Remove power to luminaire.
- Step 2. Remove diffuser mechanism (**Figure 3-5**).
- Step 3. At stepper motor mounting plate, using diagonal cutters, remove cable tie securing motor and sensor wires (**Figure 3-6**).
- Step 4. Using screwdriver, remove two 4-40x1/4"PPZ screws and 4-40 KEPS nuts that secure motor assembly to mounting plate.
- Step 5. Remove belt from motor pulley and remove motor assembly.
- Step 6. Install replacement sensor and re-install diffuser mechanism by doing Steps 2 thru 5 in reverse.

---

### 3.3.2.4 Loose Diffuser Panel Emergency Fix

**Tools:**

Needle, 1" metal (06.3003.0001) or Needle, 1/2" (06.3004.0001)  
Loctite, Superbonder 498  
Protective glasses

---

**Note:** This procedure is provided for use during an emergency situation. During transportation, all **VL4** luminaires should be placed in pack-up cues to prevent damage to diffuser panels.

---

**To repair loose diffuser panels in an emergency situation:**

- Step 1. Remove power to luminaire.
  - Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- 

**WARNING:** Wear protective glasses when applying glue to diffuser carriers.

---

- Step 3. Fit 1 or 1/2 inch needle to Loctite Superbonder 498 bottle. To verify glue flows smoothly, allow few drops of glue to flow thru needle.
- Step 4. At diffuser, position diffuser panels so that diffuser carriers on first clear diffuser panels of both sets are accessible thru aperture in front plate.
- Step 5. Tilt luminaire head slightly down. Apply 1/16 inch fillet bead of glue along edge of lower carrier of first clear diffuser panel on one set of panels. Ensure that glue does not spill over edges of diffuser carrier.
- Step 6. Apply glue to first diffuser panel of other set of panels.
- Step 7. Tilt luminaire head slightly away. Apply bead of glue along edge of upper carrier of first diffuser panel on one set of panels.
- Step 8. Apply glue to first diffuser panel of other set of panels.
- Step 9. Allow glue to set before exercising diffuser.
- Step 10. Secure head covers to side rails with 12, 6-32x5/16"PPB screws.

### 3.3.3 Dimmer/Filter/Douser Assembly Maintenance

#### 3.3.3.1 Dimmer/Filter/Douser Assembly Removal and Replacement

**Parts:**

1 EA ASSY, DIMMER/FILTER/DOUSER (VL4) (22.4005.0001)

**Tools:**

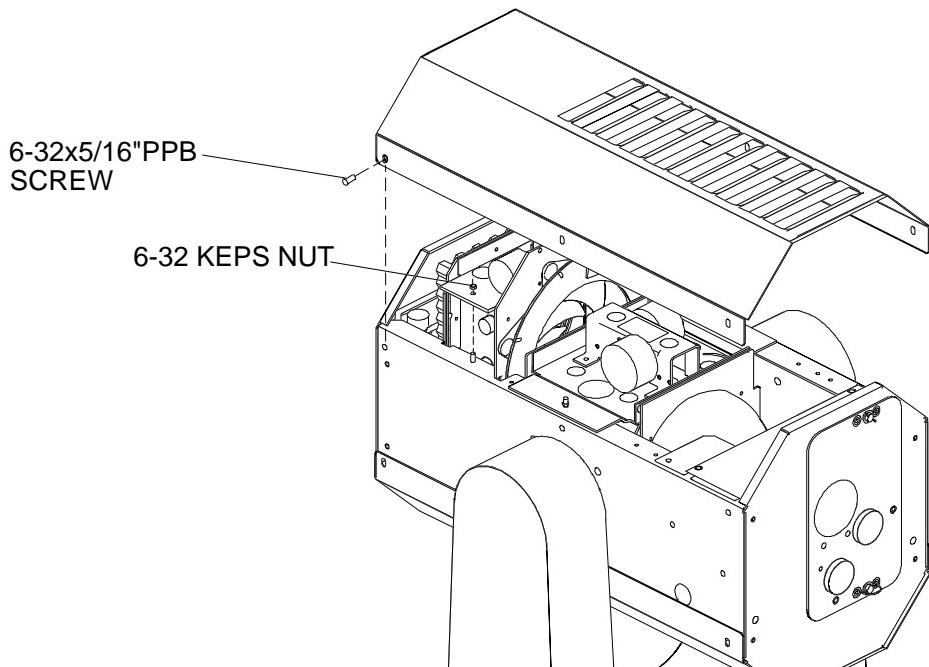
Screwdriver, Phillips #1

Screwdriver, Phillips #2

Nutdriver, 5/16 inch

**To remove and replace dimmer/filter/douser assembly:**

- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-7**).
- Step 3. At yoke termination board, disconnect dimmer/douser connectors.
  - a. 4-pin connector from header marked YTB-P15.
  - b. 8-pin connector from header marked YTB-P14.
  - c. 4-pin magenta connector from header marked YTB-P11.
  - d. 8-pin magenta connector from header marked YTB-P10.
  - e. 4-pin dimmer connector from header marked YTB-P12.
  - f. 8-pin dimmer connector from header marked YTB-P13.
  - g. 4-pin douser connector from header marked YTB-P5.
- Step 4. Remove dimmer/filter/douser assembly.
  - a. Move diffuser connectors wires away from work area.
  - b. Using 5/16 inch nutdriver, remove two 6-32 KEPS nuts that secure dimmer/filter/douser bulkhead in luminaire head and slide bulkhead out of luminaire head.
  - c. Place bulkhead in dimmer/filter/douser assembly protection box honeycomb side down.



**Figure 3-7. Dimmer/Filter/Douser Assembly Removal and Replacement**

Step 5. Install bulkhead by doing Steps 2 thru 4 in reverse.

### 3.3.3.2 Magenta Stepper Motor Removal and Replacement

#### Parts:

1 EA ASSY, MOTOR & MOUNT, DFD (22.9628.0239)

#### Tools:

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Nutdriver, 5/16 inch

Versilube

**Note:** The stepper motors currently manufactured have a larger bearing than older versions. The larger bearing does not fit the magenta motor mount. Since it is not possible to modify the motor mount outside of a shop, a repair assembly has been created with a new motor and a modified mounting bracket. The required MTA connectors and strain relief are part of the repair assembly.

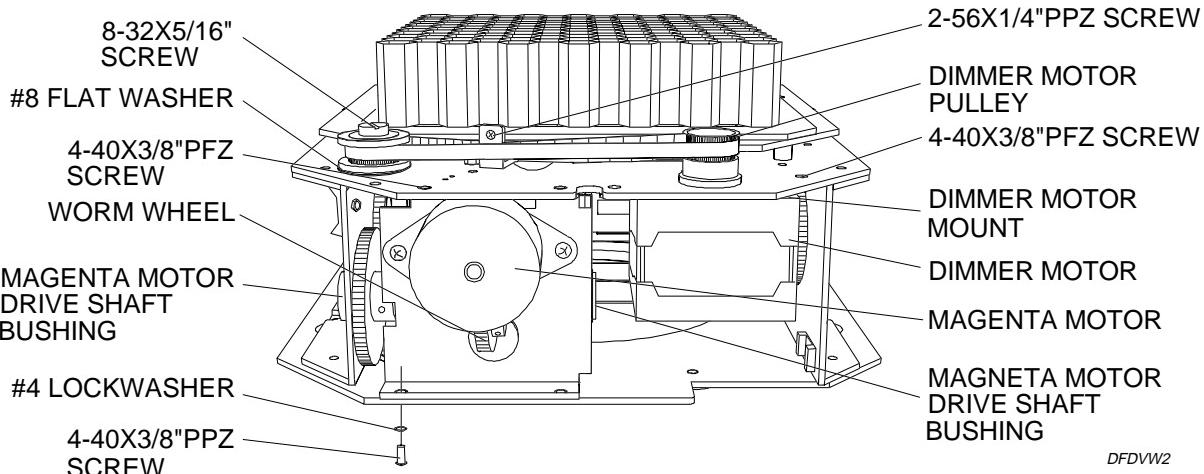
Step 1. Remove power to luminaire.

Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

**Note:** If bulkhead is fitted with black, Kevlar dimmer belt replace black belt with new blue belt (10.9628.0221).

Step 3. Remove dimmer motor (with mount and pulley) and magenta motor (with mount).

- At magenta motor, remove two 4-40x3/8"PFZ screws and two 4-40x3/8"PPZ screws and #4 internal tooth lock washers that secure motor mount to bulkhead.
- Remove motor mount.



**Figure 3-8. Magenta Stepper Motor Removal and Replacement**

---

**Note:** Magenta motor drive shaft has two bearings that secure shaft in place, one in bulkhead and one in motor mount. Bearings are not glued in place and may fall out when motor or drive shaft is removed.

---

Step 4. Prepare and install replacement motor.

- a. Apply thick bead of Versilube onto magenta stepper motor worm wheel.
  - b. Verify that motor mount drive shaft bearing is installed in place.
  - c. Install drive shaft in place on motor mount assembly.
- 

**Note:** Drive shaft will not be secured in place until shaft is installed in bulkhead bushing.

---

- d. Install and fully tighten two 4-40x3/8"PFZ screws and two 4-40x3/8"PPZ screws and #4 internal tooth lock washers that secure motor mount in bulkhead.

Step 5. Complete replacement by doing Steps 2 and 3 in reverse.

### 3.3.3.3 Filter Sensor Removal and Replacement

**Parts:**

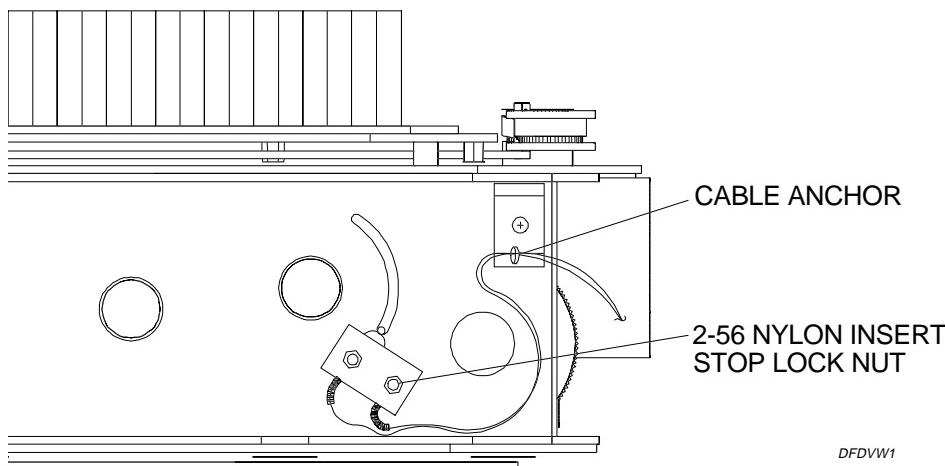
- 1 EA ASSY, MICROSWITCH WITH 24 AWG WIRES  
(22.1023.0003)
- 1 EA CONN HOUSING, MTA CLOSED END NATURAL 4 PIN  
(52.6300.0001)
- 1 EA COVER, STRAIN RELIEF, 4 POS MTA (52.6424.0004)

**Tools:**

- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- Nutdriver, 1/4 inch
- Nutdriver, 5/16 inch
- Pliers, needle-nosed
- Diagonal cutters
- MTA Crimper
- Fine point permanent ink marker

**To remove and replace magenta filter sensor:**

- Step 1. Remove power to luminaire.
- Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).
- Step 3. Remove filter sensor.
  - a. At bulkhead cable anchors, remove cable tie securing wires to cable anchors (**Figure 3-9**).
  - b. At sensor, using 1/4 inch nutdriver, remove two 3-56 nylon insert stop lock nuts that secure sensor to front aperture plate and remove sensor.



**Figure 3-9. Dimmer/Filter/Douser Sensor Removal and Replacement**

Step 4. Prepare and install replacement sensor.

- a. At replacement sensor assembly, using needle-nosed pliers, bend unused sensor lead to 45° angle.
- b. Trim sensor assembly wires to 17 inches.

---

**CAUTION:** To avoid poor connections, do not reuse MTA connector from removed sensor on replacement sensor.

---

- c. Using MTA crimper, crimp wires into new 4-pin MTA connector using the following pinouts:

Pin	Wire
4	Blue
3	Blue
2	N/C
1	N/C

- d. Install strain relief cover on 4-pin connector. Using permanent ink marker, mark strain relief as MAG.

---

**CAUTION:** Do not overtighten nuts when installing replacement sensor.

---

- e. Install replacement sensor and re-assemble dimmer/filter/douser assembly by doing Steps 2 and 3 in reverse.

---

**Note:** During installation of sensor, make sure that sensor is installed with microswitch pointing towards honeycomb.

---

### 3.3.3.4 Magenta Motor Worm Wheel and Spur Gear Removal and Replacement

**Parts:**

- 1 EA WORM WHEEL, MOLDED 48P 40T 3/16F 1/4"  
(55.6570.0002) - White
- 1 EA GEAR, SPUR (10.9628.0021)

**Tools:**

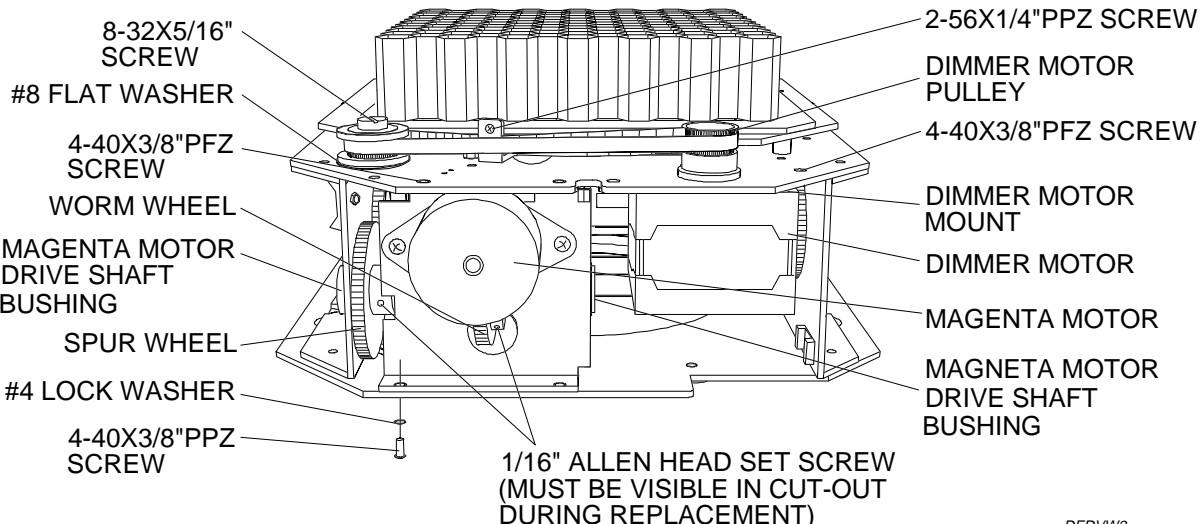
- Screwdrivers, Phillips #1 and #2
- Screwdriver, slotted #2
- Nutdriver, 5/16 inch
- Diagonal cutters
- Wrench, Allen 1/16 inch
- Versilube

**To remove and replace magenta assembly motor worm wheel:**

- Step 1. Remove power to luminaire.
- Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

**Note:** If bulkhead is fitted with black, Kevlar dimmer belt, replace black belt with new blue belt (10.9628.0221).

- Step 3. Remove dimmer motor (with mount and pulley) and magenta motor (with mount). **Figure 3-10.**
  - a. At magenta motor, remove two 4-40x3/8"PFZ screws and two 4-40x3/8"PPZ screws and #4 internal tooth lock washers that secure motor mount to bulkhead.
  - b. Remove motor mount.



DFDVW2

**Figure 3-10. Worm Wheel Removal and Replacement**

---

**Note:** Magenta motor drive shaft has two bearings that secure shaft in place, one in bulkhead and one in motor mount. Bearings are not glued in place and may fall out when motor or drive shaft is removed.

---

- Step 4. Remove spur and worm wheels from drive shaft.
  - a. Remove drive shaft from motor mount.
  - b. At spur wheel, using 1/16 inch Allen wrench, loosen setscrew in spur wheel and slide spur wheel off drive shaft.
  - c. At worm wheel, using 1/16 inch Allen wrench, loosen setscrew in worm wheel and slide wheel off drive shaft.
- Step 5. Install replacement worm wheel and spur wheel on drive shaft.
  - a. Install replacement worm wheel near center of drive shaft and loosely tighten setscrew.
  - b. Install spur wheel back onto drive shaft and loosely tighten setscrew.
  - c. Apply thick bead of Versilube onto magenta stepper motor worm wheel.
  - d. Verify that motor mount drive shaft bearings is installed in place.
- Step 6. Install motor mount and drive shaft in bulkhead.
  - a. Install drive shaft in place on motor mount.

---

**Note:** Drive shaft will not be secured in place until shaft is installed in bulkhead bearing.

---

- b. Center worm wheel with worm gear and fully tighten worm wheel setscrew.
  - c. Verify that magenta filters are in fully opened position.
  - d. Orient spur wheel so that setscrew is visible thru notched cutout in motor mount from motor side of mount and install motor mount and drive shaft in bulkhead. Verify that drive shaft is fully seated in bulkhead bearing and that spur wheel setscrew is visible.
  - e. Install and fully tighten two 4-40x3/8"PFZ screws and two 4-40x3/8"PPZ screws and #4 internal tooth lock washers that secure motor mount in bulkhead.
  - f. At bulkhead drive shaft bearings, while pushing in drive shaft with index finger, using thumb, pull spur wheel as far as possible to bulkhead bearing and tighten spur wheel setscrew. This reduces spur wheel end play.
- Step 7. Complete replacement by doing Steps 2 and 3 in reverse.

### 3.3.3.5 Dimmer Belt Removal and Replacement

**Parts:**

1 EA BELT, DFD, VL4, .0826P, 98T, .250W (10.9628.0221)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Screwdriver, slotted #2

Nutdriver, 5/16 inch

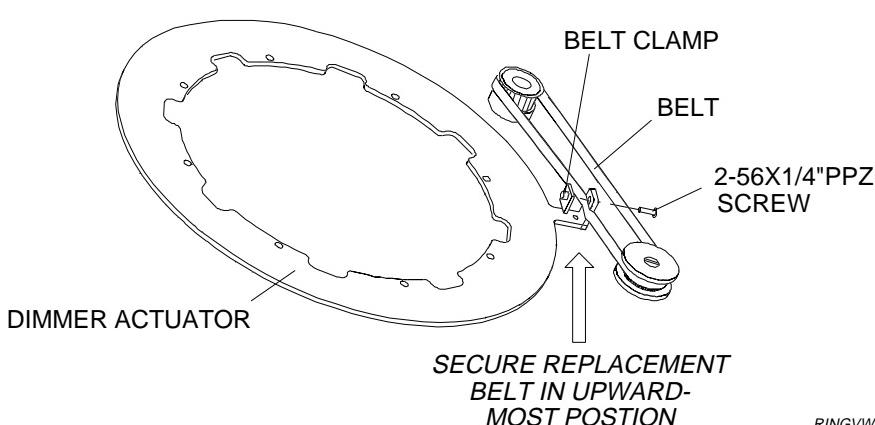
**To remove and replace dimmer/filter/douser assembly dimmer belt:**

Step 1. Remove power to luminaire.

Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

Step 3. Remove belt.

- With honeycomb facing up, at dimmer motor belt, remove 2-56x1/4"PPZ screw that secures belt clamp to dimmer actuator tab and remove clamp and screw (**Figure 3-11**).
- Slip belt over end of one pulley and remove.



**Figure 3-11. Dimmer/Filter/Douser Assembly Dimmer Belt Removal and Replacement**

**Note:** If bulkhead is fitted with black, Kevlar dimmer belt, replace black belt with new blue belt (10.9628.0221).

Step 4. Install replacement belt.

- Slip new belt over pulley.
- While holding belt in upward most position, replace clamp and tighten in place with 2-56x1/4"PPZ screw. (This will ensure belt will not collide with dimmer micro switch.)

### 3.3.3.6 Dimmer Sub-Micro Switch Removal and Replacement

**Parts:**

1 EA ASSY, SWITCH, SUB-MICRO W/WIRES (VL4 DIM)  
(22.1026.0002)

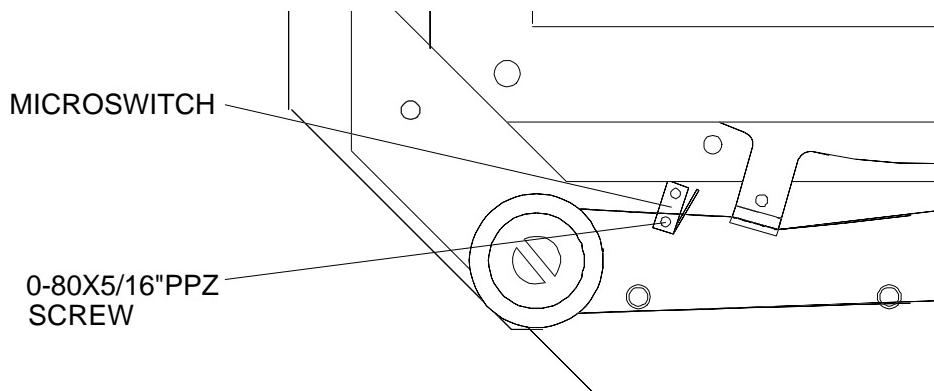
**Tools:**

Screwdriver, Phillips #1  
Screwdriver, Phillips #2  
Nutdriver, 5/16 inch

**To remove and replace dimmer/filter/douser assembly sub-micro switch:**

- Step 1. Remove power to luminaire.
- Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).
- Step 3. Remove sub-micro switch.
  - a. Remove two 0-80x5/16"PPZ screws (and KEPS nuts if used) that secure switch to bulkhead and remove switch (**Figure 3-12**).
- Step 4. Replace switch by doing Steps 2 and 3 in reverse.

**Note:** When installing switch, verify that switch is oriented so that switch leads point towards dimmer idler pulley.



**Figure 3-12. Dimmer/Filter/Douser Sub-Micro Switch Removal and Replacement**

---

### 3.3.3.7 Dimmer Leaves Removal and Replacement

**Parts:**

1 EA ASSY, VL4 DIMMER LEAF, LFT.HAND (22.9628.0187)

1 EA ASSY, VL4 DIMMER LEAF, RT.HAND (22.9628.0188)

*as needed:*

ROLLER, DOUSER/DIMMER (10.9628.0101)

WASHER, SPECIAL .010 THK X 0500 DIA (10.9628.0105)

WASHER, SPECIAL .010 THK X .350 DIA (10.9628.0106)

WASHER, SPECIAL, .025 THK X .350 DIA (10.9628.0109)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Nutdriver, 5/16 inch

White cotton gloves

**To remove and replace iris leaves, do the following:**

Step 1. Remove power to luminaire.

Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

Step 3. Remove belt clamp.

At dimmer motor belt, remove 2-56x1/4"PPZ screw that secures belt clamp to dimmer actuator tab and remove clamp and screw (**Figure 3-11**).

---

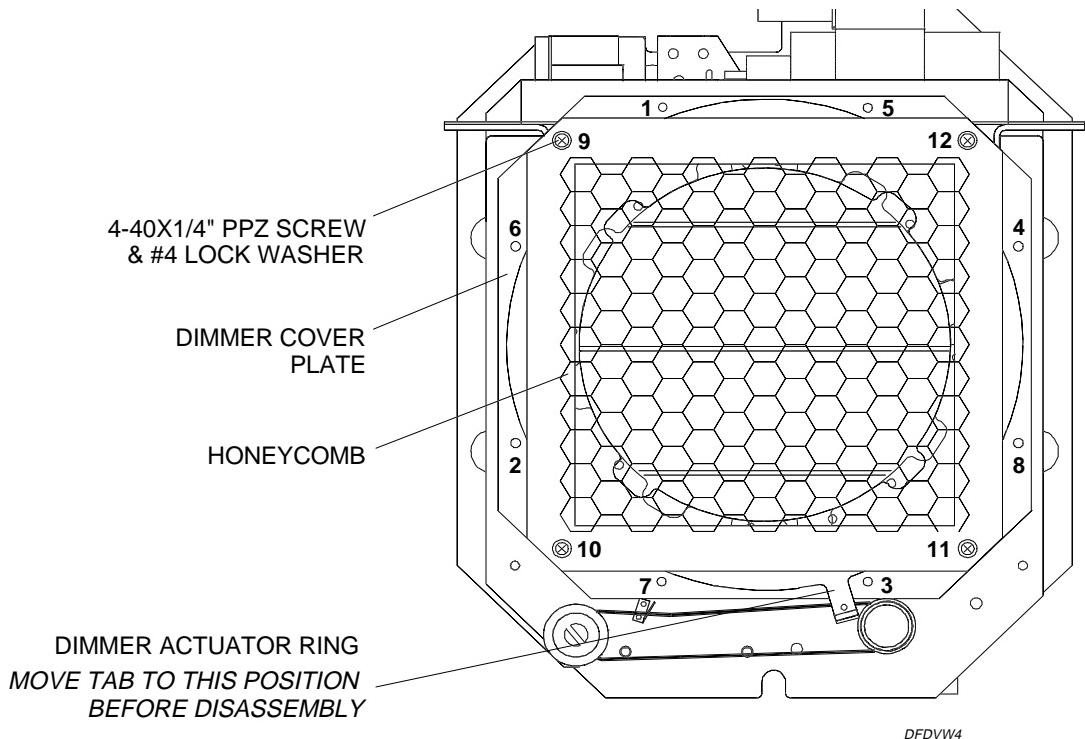
**CAUTION:** Do not touch iris leaves with bare fingers. Oils and dirt will damage iris leaves!

---

**CAUTION:** Open dimmer before removing cover plate.

Step 4. Remove honeycomb and dimmer cover plate (**Figure 3-13**).

- a. With honeycomb facing up and belt facing you , move dimmer to full open position by sliding actuator tab to right as shown.
- b. At standoffs 9, 10, 11, and 12, remove four 4-40x1/4"PPZ screws and internal tooth lockwashers that secure honeycomb and dimmer cover plate to bulkhead and remove honeycomb.
- c. Remove dimmer cover plate.



**Figure 3-13. Dimmer Cover Plate and Honeycomb Removal and Replacement**

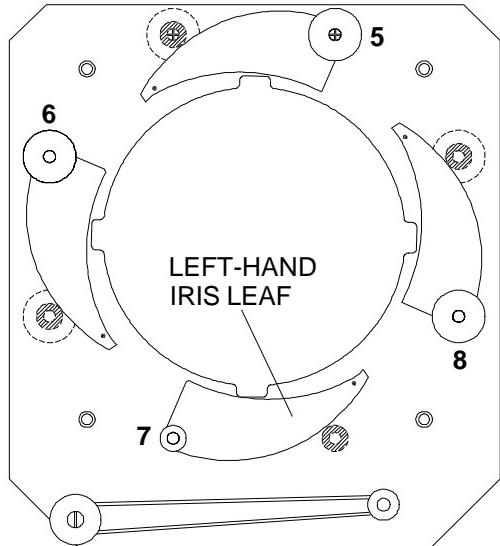
Step 5. Remove left-hand iris leaves.

- Remove two small thin nylon washers from standoff 7.
- Remove large thin nylon washer from standoffs 5, 6, and 8.
- Remove left-hand iris leaves from standoffs 5, 6, 7, and 8.

#### DISASSEMBLY STAGE 1

(○) = LARGE THIN WASHER  
(10.9628.0105)

(◎) = SMALL THIN WASHER  
(10.9628.0106)



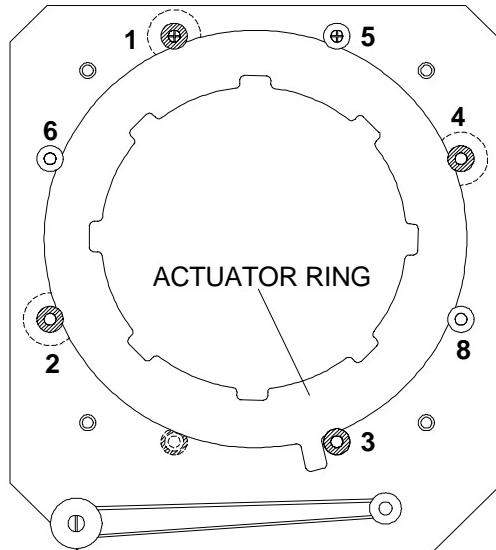
Step 6. Remove dimmer actuator ring.

- Remove small thin nylon washer from standoffs 5, 6, and 8.
- Remove small thick nylon washer from standoffs 1, 2, 3, and 4.
- Remove dimmer actuator ring.

#### DISASSEMBLY STAGE 2

◎ = SMALL THICK WASHER  
(10.9628.0109)

◎ = SMALL THIN WASHER  
(10.9628.0106)



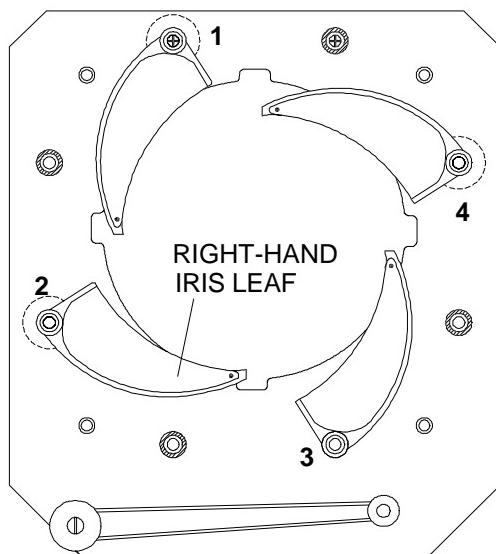
Step 7. Remove right-hand iris leaves.

- Remove nylon roller from standoffs 1, 2, 3, and 4.
- Remove small thin nylon washer from standoffs 1, 2, 3, and 4.
- Remove right-hand iris leaves from standoffs 1, 2, 3, and 4.

#### DISASSEMBLY STAGE 3

◎ = ROLLER  
(10.9628.0101)

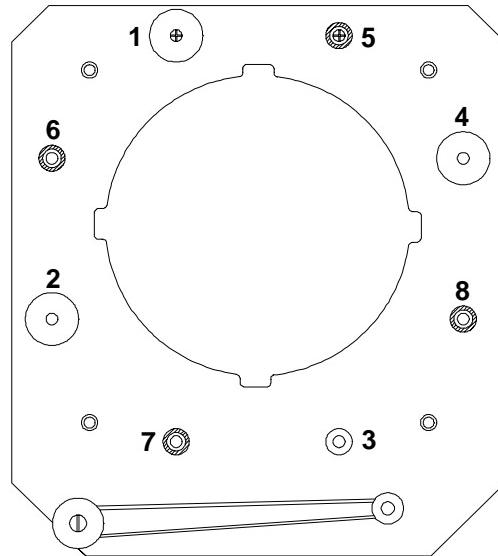
◎ = SMALL THIN WASHER  
(10.9628.0106)



Step 8. Ensure remaining rollers and washers are still in place. Stage 4 should be as follows:

DISASSEMBLY STAGE 4

- ◎ = ROLLER (10.9628.0101)
- ◎ = SMALL THIN WASHER (10.9628.0106)
- ◎ = SMALL THICK WASHER (10.9628.0109)
- ◎ = LARGE THIN WASHER (10.9628.0105)



Step 9. Replace damaged iris leaves and nylon washers. Undamaged leaves and washers can be reused during replacement.

---

**Note:** Install a new belt or re-install the belt clamp in the same position on old belt. Clamp ruins some of the belt's teeth and will cause problems if clamp is not re-installed in the same position.

Step 10. Re-assemble iris assembly by doing Steps 2 thru 7 in reverse.

- a. Right-hand iris leaves are installed on standoffs 1, 2, 3, and 4 nub side up and in fully opened position.
- b. Left-hand iris leaves are installed on standoffs 5, 6, 7, and 8 nub side down and in fully opened position. Nubs fit in holes in actuator ring.

### 3.3.3.8 Dimmer/Filter/Douser Solenoid Assembly Removal and Replacement

**Parts:**

1 EA ASSY, VL4 SOLENOID (22.9628.0231)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Diagonal cutters

Nutdriver, 5/16 inch

Permanent ink marker

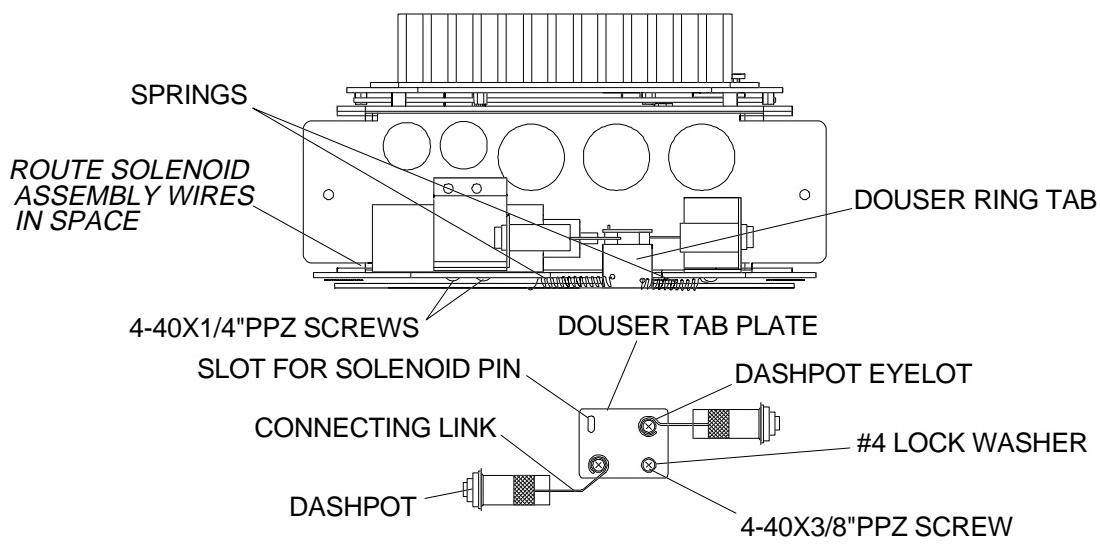
**To remove and replace dimmer/filter/douser solenoid assembly:**

Step 1. Remove power to luminaire.

Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

Step 3. Remove douser tab plate.

- At bulkhead cable anchors, remove cable tie securing wires to cable anchors (**Figure 3-14**).



SOLREMV

**Figure 3-14. Dimmer/Filter/Douser Solenoid Assembly Removal and Replacement**

- At douser tab plate, remove three 4-40x3/8"PPZ screws and #4 internal tooth lockwashers that secure plate to douser ring tab.
- At dashpots, remove eyelets from standoffs on douser tab plate and remove tab plate.

- Step 4. Remove solenoid assembly.
  - a. At solenoid clamp, loosen four 4-40x 1/4" PPZ screws that secure clamp to solenoid mounting plate and bulkhead and slide solenoid out from under clamp. It is not necessary to remove screws that secure clamp.
- Step 5. Replace solenoid by doing Steps 2 thru 4 in reverse.
- Step 6. Calibrate dashpots. Refer to Douser Dashpot Calibration paragraph.

---

### 3.3.3.9 Douser Leaves Removal and Replacement

**Parts:**

1 EA LEAF, DOUSER (10.9628.0066)

*as needed:*

ROLLER, DOUSER/DIMMER (10.9628.0101)

WASHER, SPECIAL .010 THK X .500 DIA (10.9628.0105)

WASHER, SPECIAL .010 THK X .350 DIA (10.9628.0106)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

White cotton gloves

Diagonal cutters

Needle-nosed pliers

Nutdriver, 5/16 inch

**To remove and replace douser leaves:**

Step 1. Remove power to luminaire.

Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

Step 3. Remove douser tab plate.

- a. At douser ring tab, using needle-nosed pliers, remove loop of each spring from holes in ring tab (**Figure 3-14**).
- b. At douser tab plate, remove three 4-40x3/8"PPZ screws and #4 internal tooth lockwashers that secure plate to douser ring tab.
- c. At dashpots, remove eyelets from standoffs on douser tab plate and remove tab plate.

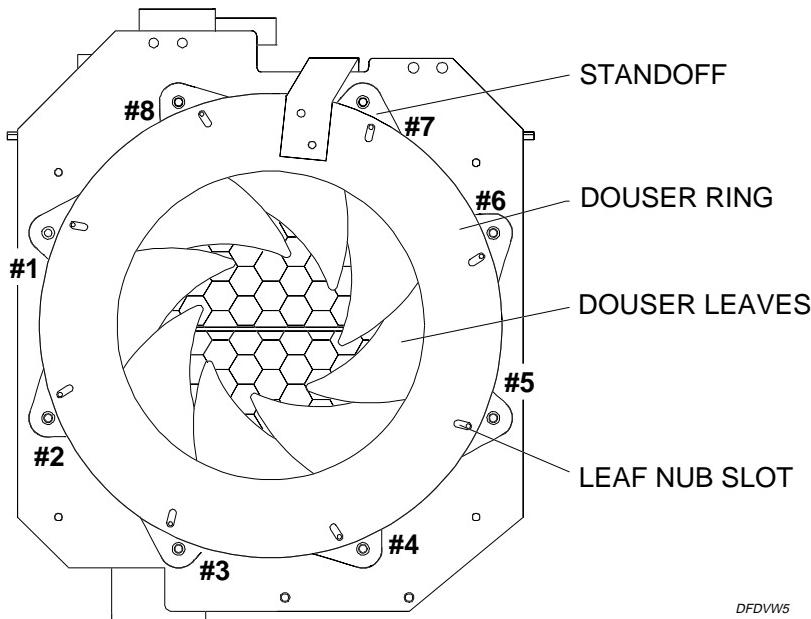
Step 4. Remove douser leaves.

- a. At douser ring, remove eight 4-40x3/16"PTHZ screws and large nylon washers (**Figure 3-15**).
- b. At standoffs, remove eight nylon rollers.
- c. At standoffs, remove eight small nylon washers.

---

**CAUTION:** Wear white cotton gloves when working with douser leaves. Oils and dirt from hands will damage douser leaves!

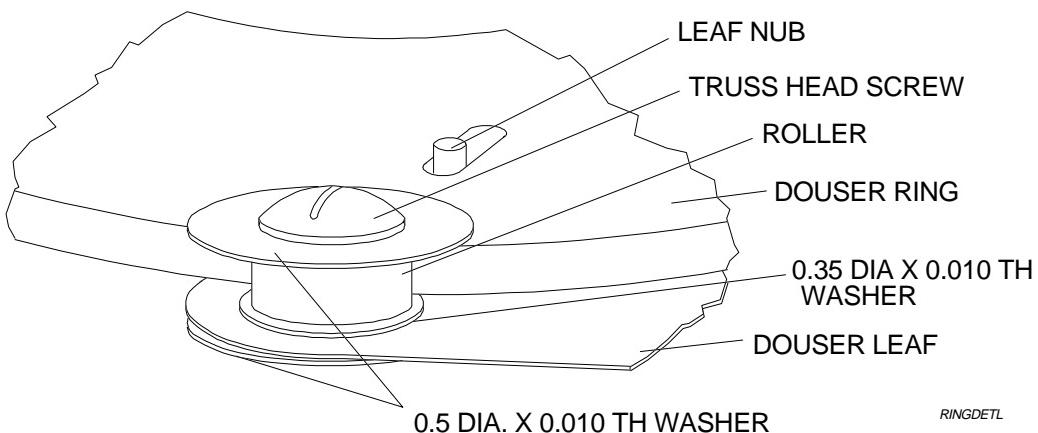
- d. Remove douser leaves.
- e. Inspect leaves and nylon washers and discard all damaged or bent items. (An easy way to check leaf for flatness is to lay leaf on UV glass.)



**Figure 3-15. Douser Leaves Removal and Replacement**

Step 5. Replace douser leaves.

- Undamaged leaves and washers may be reused.
- Starting at standoff number 1, moving counterclockwise, install douser leaves. Leaves on standoffs 2 thru 7 lay partly on top preceding leaf. Leaf on standoff number 8 rests on top of leaves on standoffs 1 and 7.
- Complete bulkhead assembly and installation by doing Steps 2 thru 9 in reverse. Refer to **Figure 3-16** for placement of douser leaf attachment hardware. Be careful to not clamp down on 0.35 dia. X 0.010 thick washer.



**Figure 3-16. Douser Leaf Attachment Hardware Placement**

Step 6. Calibrate dashpots. Refer to Douser Dashpot Calibration paragraph.

### 3.3.3.10 Douser Spring Removal and Replacement

**Parts:**

1 EA SPRING, SS 4.6#/IN. EXTENSION (55.6603.0001)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Diagonal cutters

Needle-nosed pliers

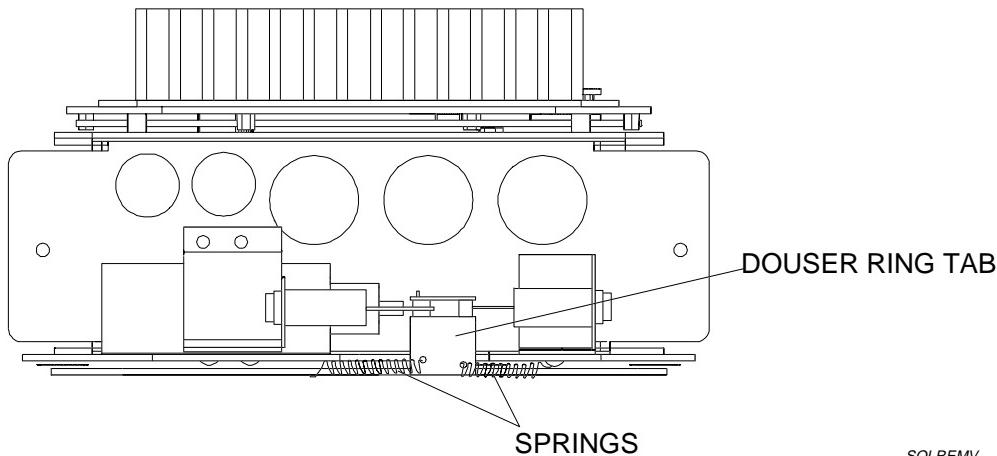
Nutdriver, 5/16 inch

**To remove and replace douser spring:**

Step 1. Remove power to luminaire.

Step 2. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).

Step 3. At damaged douser spring, using needle-nosed pliers, remove spring (**Figure 3-17**).



**Figure 3-17. Douser Spring Removal and Replacement**

- Step 4. Replace douser spring by doing Steps 2 and 3 in reverse order.
- Step 5. Calibrate dashpots. Refer to Douser Dashpot Calibration paragraph.

### 3.3.3.11 Douser Dashpot Calibration

#### Tools:

Screwdriver, Phillips #1

Artisan console

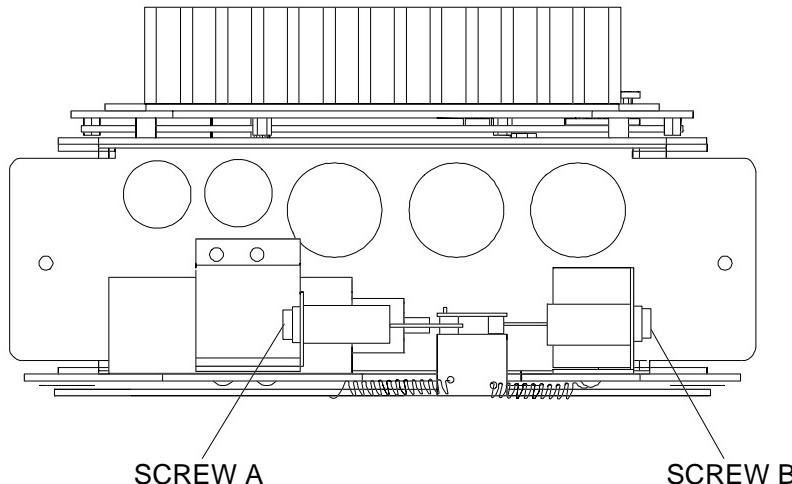
The dashpot is a piston traveling in a glass cylinder. The adjustment screw controls the air pressure that builds up in the cylinder as the piston approaches the end of the cylinder. The dashpot only works for one direction of travel, so there are two dashpots linked to the douser mechanism. The dashpots are used to cushion the shock of the douser mechanism when it opens and closes. Without dashpots, the douser mechanism would eventually damage itself as it slams open and shut. If adjustment is too loose, the douser mechanism slams open or shut. If adjustment is too tight, the douser mechanism will not fully open and shut.

**Hint:** In a properly adjusted dashpot, the piston goes to end of travel and stops with no clicking sound and no slowing down.

#### To calibrate douser dashpots:

Step 1. Connect luminaire to console.

Step 2. Using console, cycle douser. During cycling process, adjust screw "A" (**Figure 3-18**) so that dashpot piston just stops at end of travel.



**Figure 3-18. Dimmer/Filter/Douser Assembly Douster Dashpot Calibration**

Step 3. Repeat procedure for closing portion of cycle by adjusting screw "B."

Step 4. Run douser for 5 minutes at 0.25 second chase rate (one step consists of fully open and close stroke) with lamp extinguished. Verify that douser works properly at end of 5 minute period.

### 3.3.4 Miscellaneous Head Assembly Maintenance

#### 3.3.4.1 Lamp Removal and Replacement

**Parts:**

1 EA ASSY, VL2X LAMP SOCKET W/SERIES 30 PINS  
(22.2521.0001)

**Tools:**

none

**To remove and replace lamp:**

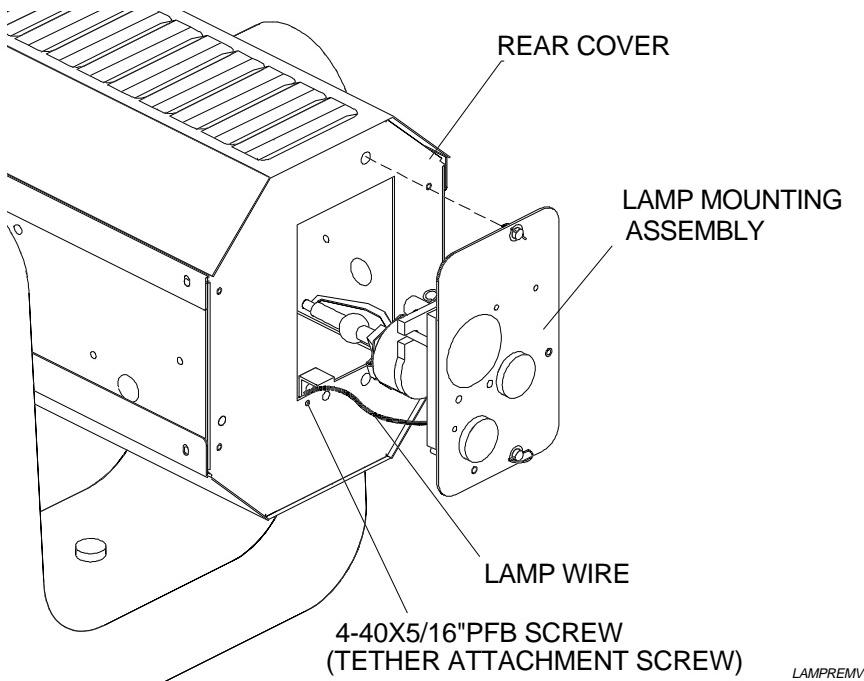
Step 1. Remove power to luminaire.

---

**CAUTION:** Do not touch glass envelope of lamp with bare fingers. Oils on fingers will deteriorate glass when heated and may cause glass to explode.

---

Step 2. At lamp assembly, turn 1/4-turn fasteners on rear of lamp assembly and carefully slide out lamp assembly from luminaire head (**Figure 3-19**).



**Figure 3-19. Lamp Assembly Removal and Replacement**

- Step 3. At lamp carriage, squeeze and lift lamp retainer. Remove lamp from lamp carriage.
- Step 4. Install new lamp by doing Steps 2 thru 3 in reverse.

---

### 3.3.4.2 Lamp Assembly Socket Removal and Replacement

**Parts:**

1 EA ASSY, VL2X LAMP SOCKET W/SERIES 30 PINS  
(22.2521.0001)

**Tools:**

Screwdriver, Phillips #1  
Screwdriver, slotted #1  
Wrench, 1/4 inch, open end

**To remove and replace lamp assembly lamp socket:**

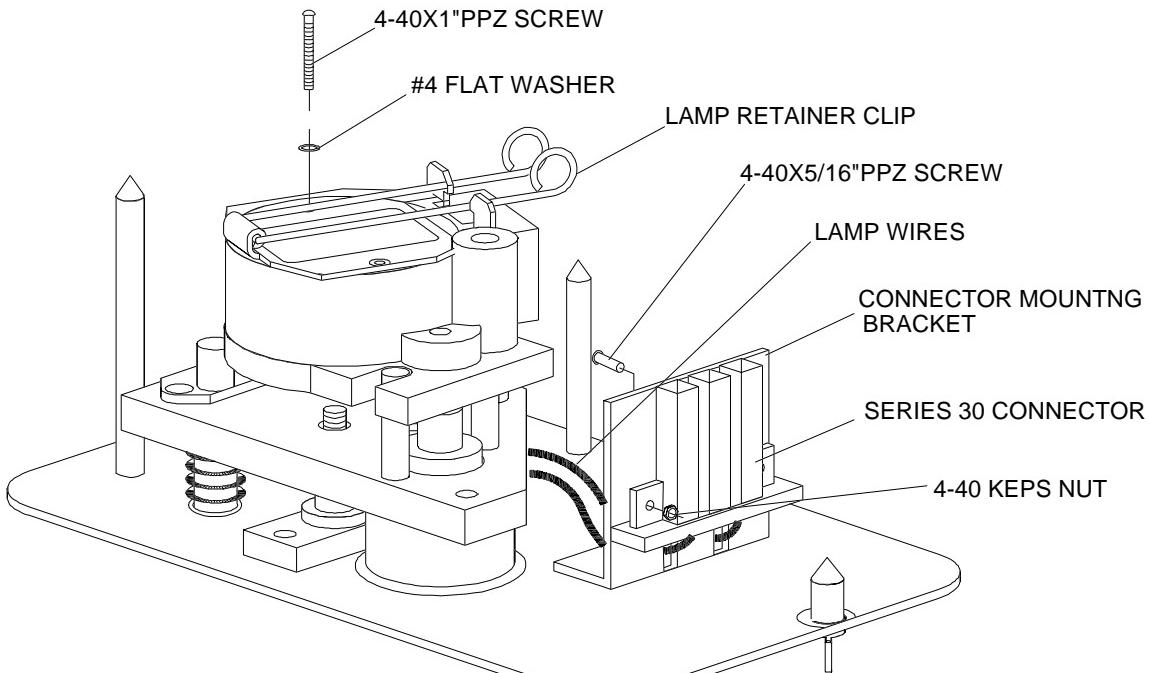
- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination board, disconnect 8-pin IDC connector from header marked FOCUS.

---

**CAUTION:** Do not touch glass envelope of lamp with bare fingers. Oils on fingers will deteriorate glass when heated and may cause glass to explode.

---

- Step 4. Remove lamp assembly.
  - a. At lamp assembly, turn 1/4-turn fasteners on rear of lamp assembly and carefully slide out lamp assembly from luminaire head (**Figure 3-19**).
  - b. At lamp assembly opening, remove one 4-40x5/16"PFB screw, #6 flat washer, and 4-40 KEPS nut that secures lamp assembly safety tether to luminaire and remove lamp assembly.
- Step 5. Remove lamp.
  - a. At lamp carriage, squeeze and lift lamp retainer (**Figure 3-20**).
  - b. Remove lamp from lamp carriage.



**Figure 3-20. Lamp Socket Removal and Replacement**

- Step 6. Disconnect socket wires and remove socket.
- a. At 30 series connector, while using 1/4 inch open end wrench to hold 4-40 KEPS nuts, remove two 4-40x5/16"PPZ screws and 4-40 KEPS nuts that secure series 30 connector to lamp wire connector bracket.
  - b. Using #1 slotted screwdriver, push pins 1 and 3 out of series 30 connector.
  - c. At lamp retainer, remove two 4-40x1"PPZ screws and #4 flat washers that secure retainer to lamp socket and remove retainer and lamp socket.
- Step 7. Replace lamp socket by doing Steps 2 thru 6 in reverse.

---

### 3.3.4.3 Lamp Mounting Assembly Actuator Motor Removal and Replacement (*Shop Only*)

**Parts:**

- 1 EA MOTOR, LINEAR ACTUATOR 12V (44.5013.0001)
- 1 EA CONN HOUSING, MTA CLOSED END BLUE 8PIN (52.6383.0001)
- 1 EA COVER, STRAIN RELIEF /8POS MTA (52.6424.0008)

**Tools:**

- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- Diagonal cutters
- Wrench, 11/32 inch
- MTA crimper
- Nut driver, 3/16 inch
- Permanent ink marker

**To remove and replace lamp mounting assembly actuator motor:**

- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination board, disconnect 8-pin IDC connector from header marked FOCUS.
- Step 4. Remove lamp assembly.
  - a. At lamp assembly, turn 1/4-turn fasteners on rear of lamp assembly and carefully slide out lamp assembly from luminaire head (**Figure 3-19**).
  - b. At lamp assembly opening, remove one 4-40x5/16"PFB screw and 4-40 KEPS nut that secures lamp assembly safety tether to luminaire and remove lamp assembly.
  - c. At lamp mounting assembly, at safety tether, remove 4-40x3/8"PPB screw and 4-40 KEPS nut that secures cable anchor and tether to lamp assembly.

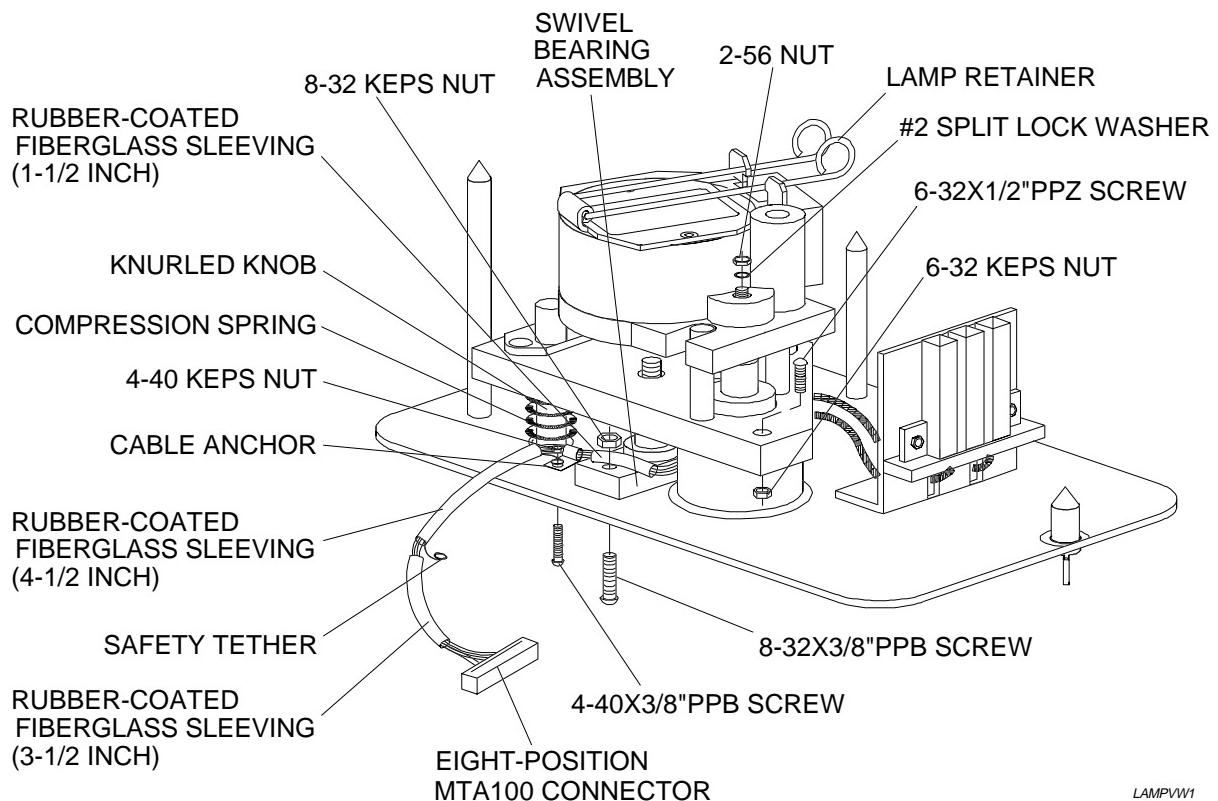
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**CAUTION:** Do not touch glass envelope of lamp with bare fingers. Oils on fingers will deteriorate glass when heated and may cause glass to explode.

---

- Step 5. At lamp carriage, squeeze and lift lamp retainer. Remove lamp from carriage.

- Step 6. Remove actuator motor wire sleeving and safety tether (**Figure 3-21**).
- Using diagonal cutters, remove cable ties from ends of middle piece of rubber-coated fiberglass sleeving.
  - Using diagonal cutters, remove 8-pin MTA100 connector.
  - Slide off three pieces of sleeving and safety tether from linear actuator motor wires.



**Figure 3-21. Lamp Mounting Assembly Actuator Motor Removal and Replacement**

- Step 7. Remove linear actuator motor.
- At rear of lamp access plate, fully unscrew two knurled knobs and remove knobs and compression springs from lamp assembly. (Phillips screwdriver may be necessary to remove knobs.)
  - At swivel bearing assembly, while using utility 11/32 inch wrench to hold 8-32 KEPS nuts, remove two 8-32x3/8" PPB screws. Linear actuator mounting plate should now be free of lamp access plate.
  - At linear actuator motor shaft, using 3/16 inch nutdriver, remove 3-56 nut and #2 split lock washer to separate lamp socket from linear actuator mounting plate.

- d. At linear actuator motor, remove two 6-32x1/2"PPZ screws and 6-32 KEPS nuts that secure motor to mounting plate and remove motor.

- Step 8. Install replacement actuator motor.
- a. Secure replacement linear actuator motor to mounting plate with two 6-32x1/2"PPZ screws and 6-32 KEPS nuts.
- Step 9. Re-install sleeving and safety tether on wires.
- a.. At replacement motor wires, slide on 1-1/4 inch rubber-coated fiberglass sleeving as far down wires as possible.
  - b. Install cable anchor over motor wires immediately following 1-1/4 inch rubber-coated fiberglass sleeving with screwhole pointing away from swivel bearing assembly.
  - c. Slide 4-1/2 inch piece of rubber-coated fiberglass sleeving over motor wires.
  - d. Insert safety tether in 4-1/2 inch piece of rubber-coated fiberglass sleeving along with motor wires.
  - e. Using two cable ties, secure ends of 4-1/2 inch piece of rubber-coated fiberglass sleeving. Verify that ends of safety tether extend past cable ties.
  - f. Slide 3-1/2 inch piece of rubber-coated fiberglass sleeving over remaining motor wire.

---

**CAUTION:** To avoid poor connections, do not reuse MTA connector from removed motor.

---

- Step 10. Crimp MTA100 connector to actuator motor wires.
- a. Using MTA crimper, crimp motor wires to new 8-pin MTA connector using the following pinouts:

Pin	Wire
8	Orange
7	Yellow
6	Black
5	Brown
4	Red
3	Green
2	N/C
1	N/C

- b. Install strain relief cover on 8-pin connector. Using permanent ink marker, mark strain relief FOCUS.
- Step 11. Re-assemble and install lamp assembly by doing Steps 2 thru 7 in reverse.

### 3.3.4.4 Yoke Termination Board Removal and Replacement

**Parts:**

- 1 EA PCB ASSY, VL4 YOKE CABLE TERM (YTB)  
(24.9628.0049)

**Tools:**

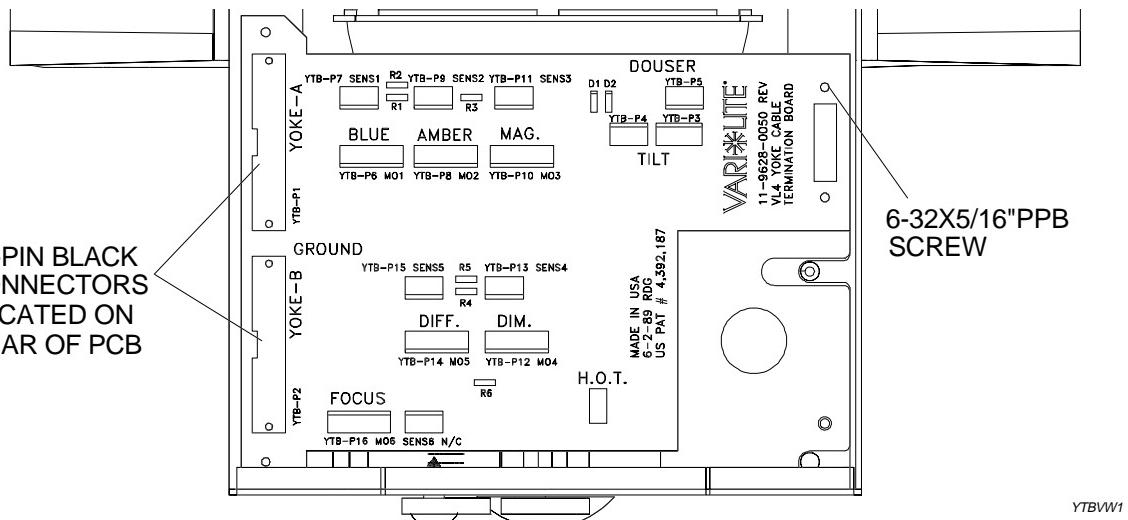
- Screwdriver, Phillips #1  
Screwdriver, Phillips #2

**To remove and replace yoke termination board:**

- Step 1. Remove power to luminaires.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination board, disconnect all connectors.
  - a. 4-pin connector from AMBER header marked YTB-P9.
  - b. 8-pin connector from AMBER header marked YTB-P8.
  - c. 4-pin connector from BLUE header marked YTB-P7.
  - d. 8-pin connector from BLUE header marked YTB-P6.
  - e. 4-pin connector from MAG header marked YTB-P11.
  - f. 8-pin connector from MAG header marked YTB-P10.
  - g. 4-pin connector from DOUSER header marked YTB-P5.
  - h. 5-pin connector from TILT header marked YTB-P3.
  - j. 4-pin connector from TILT header marked YTB-P4.
  - k. 4-pin connector from DIM header marked YTB-P13.
  - m. 8-pin connector from DIM header marked YTB-P12.
  - n. 4-pin connector from DIFF header marked YTB-P15.
  - o. 8-pin connector from DIFF header marked YTB-P14.
  - p. 8-pin connector from FOCUS header marked TB-P16.
- Step 4. Remove yoke termination board.
  - a. At left and right sides of yoke termination board, remove four 6-32x5/16"PPB screws that secure board to side rails (**Figure 3-22**).
  - b. Pull out yoke termination board.

**Note:** Cables should only come out of side rail approximately 1 to 1-1/2".

- c. At left of board, disconnect two 26-pin black connectors of yoke cable assembly and remove board.



**Figure 3-22. Yoke Termination Board Removal and Replacement**

Step 5. Replace yoke termination board by doing Steps 2 thru 4 in reverse.

---

**Note:** 26-pin connector with blue heat shrink is connected to header marked YOKE B (Blue) and 26-pin connector with yellow heat shrink is connected to header marked YOKE A (Amber).

---

### 3.3.4.5 Ignitor PCB Removal and Replacement

**Parts:**

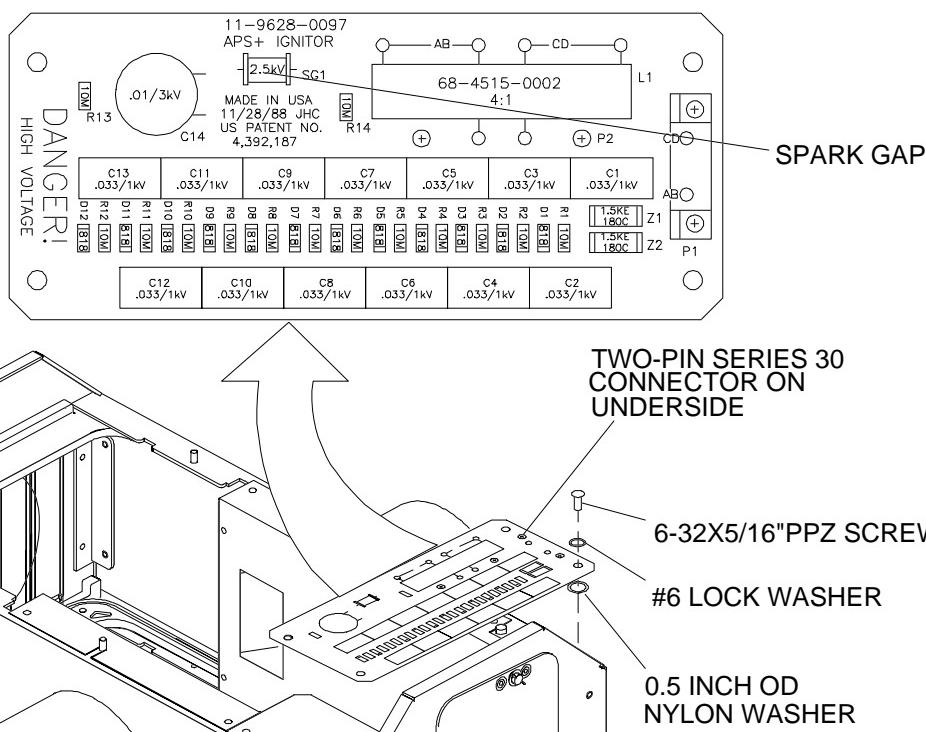
1 EA PCB ASSY, VL4 IGNITOR (IGN4) (24.9628.0096)

**Tools:**

Screwdrivers, Phillips #1 and #2

**To remove and replace ignitor board:**

- Step 1. Remove power to luminaires.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At lamp assembly, turn 1/4-turn fasteners and carefully slide lamp assembly out of luminaire head (**Figure 3-19**).
- Step 4. Remove ignitor board.
  - a. At ignitor board, remove four 6-32x5/16"PPZ screws and #6 internal tooth lock washers that secure ignitor board to side rails and pull out board (**Figure 3-23**). White, nylon 0.5 inch spacers may fall off rear of board when board is removed.
  - b. At right side, disconnect two-pin red series 30 connector from board and remove board.



**Figure 3-23. Ignitor Board and Spark Gap Removal and Replacement**

Step 5. Replace ignitor board by doing Steps 2 thru 5 in reverse.

---

### 3.3.4.6 Ignitor PCB Spark Gap Removal and Replacement (*Shop Only*)

**Parts:**

1 EA SPARK GAP, 2.5KV (75.7102.0001)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Soldering iron and solder

**To remove and replace ignitor board 2.5KV spark gap:**

- Step 1. Remove power to luminaires.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. Remove ignitor board assembly (**Figure 3-23**).
- Step 4. Unsolder spark gap from ignitor board.
- Step 5. Install replacement spark gap and re-install ignitor board by doing Steps 2 thru 4 in reverse.

### 3.3.4.7 Tilt Mechanism Removal and Replacement

**Parts:**

1 EA ASSY, TILT MECHANISM (VL4) (22.4004.0001)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

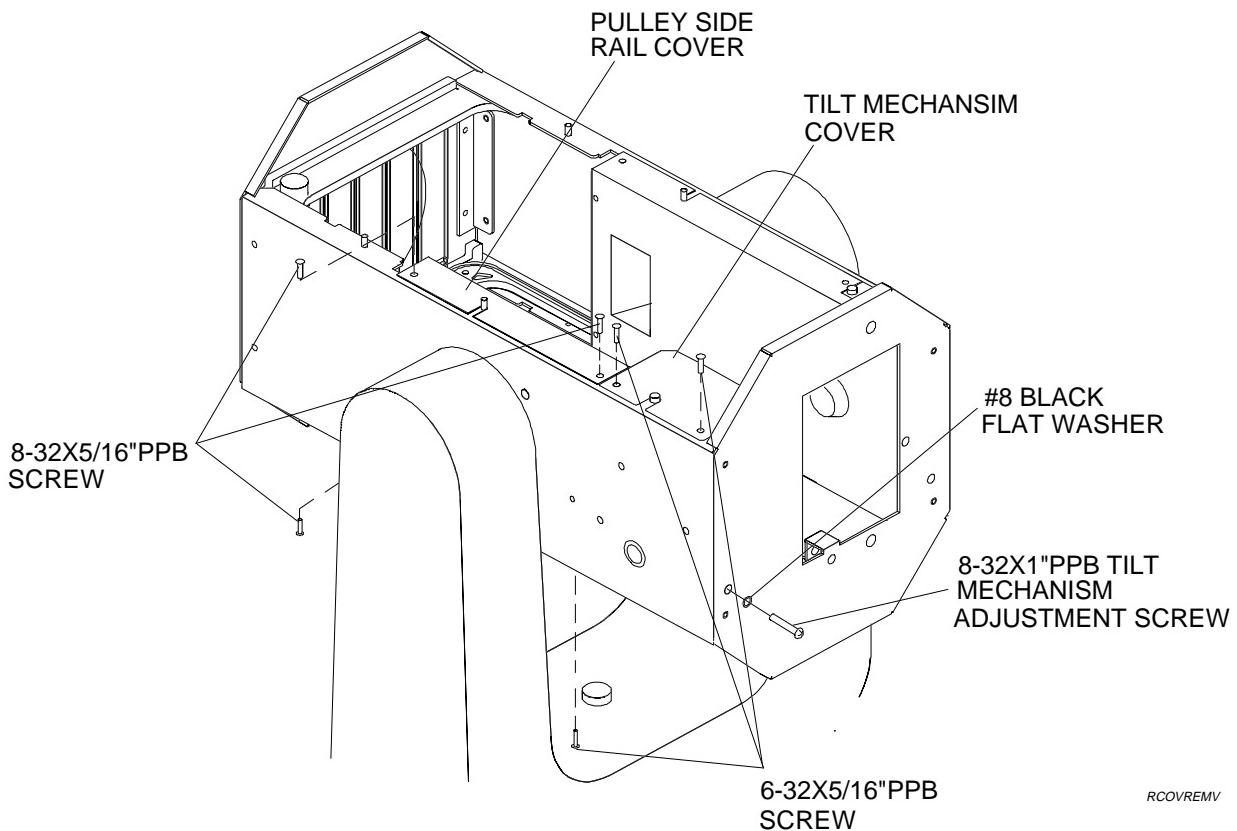
Nutdriver, 5/16 inch

Versilube

**To remove and replace tilt mechanism:**

- Step 1. Remove power to luminaire.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination board, disconnect all connectors.
  - a. 4-pin connector from AMBER header marked YTB-P9.
  - b. 8-pin connector from AMBER header marked YTB-P8.
  - c. 4-pin connector from BLUE header marked YTB-P7.
  - d. 8-pin connector from BLUE header marked YTB-P6.
  - e. 4-pin connector from MAG header marked YTB-P11.
  - f. 8-pin connector from MAG header marked YTB-P10.
  - g. 4-pin connector from DOUSER header marked YTB-P5.
  - h. 5-pin connector from TILT header marked YTB-P3.
  - j. 4-pin connector from TILT header marked YTB-P4.
  - k. 4-pin connector from DIM header marked YTB-P13.
  - m. 8-pin connector from DIM header marked YTB-P12.
  - n. 4-pin connector from DIFF header marked YTB-P15.
  - o. 8-pin connector from DIFF header marked YTB-P14.
  - p. 8-pin connector from FOCUS header marked TB-P16.
- Step 4. Remove yoke termination board (**Figure 3-22**).
- Step 5. Remove lamp assembly.
  - a. At lamp assembly, turn 1/4-turn fasteners on rear of lamp assembly and carefully slide out lamp assembly from luminaire head (**Figure 3-19**).
- Step 6. At lamp carriage, squeeze and lift lamp retainer. Remove lamp from carriage.
- Step 7. Remove blue/amber bulkhead (**Figure 3-1**).

- Step 8. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).
- Step 9. Remove ignitor board (**Figure 3-23**).
- Step 10. Remove pulley side rail cover and tilt mechanism cover.
- At pulley side rail cover, remove three 6-32x5/16"PPB screws that secure pulley side rail cover to side rail and remove cover (**Figure 3-24**).
  - At tilt mechanism cover, remove three 6-32x5/16"PPB screws that secure tilt mechanism cover to side rail and remove cover.



**Figure 3-24. Pulley Side Rail and Tilt Mechanism Cover Removal and Replacement**

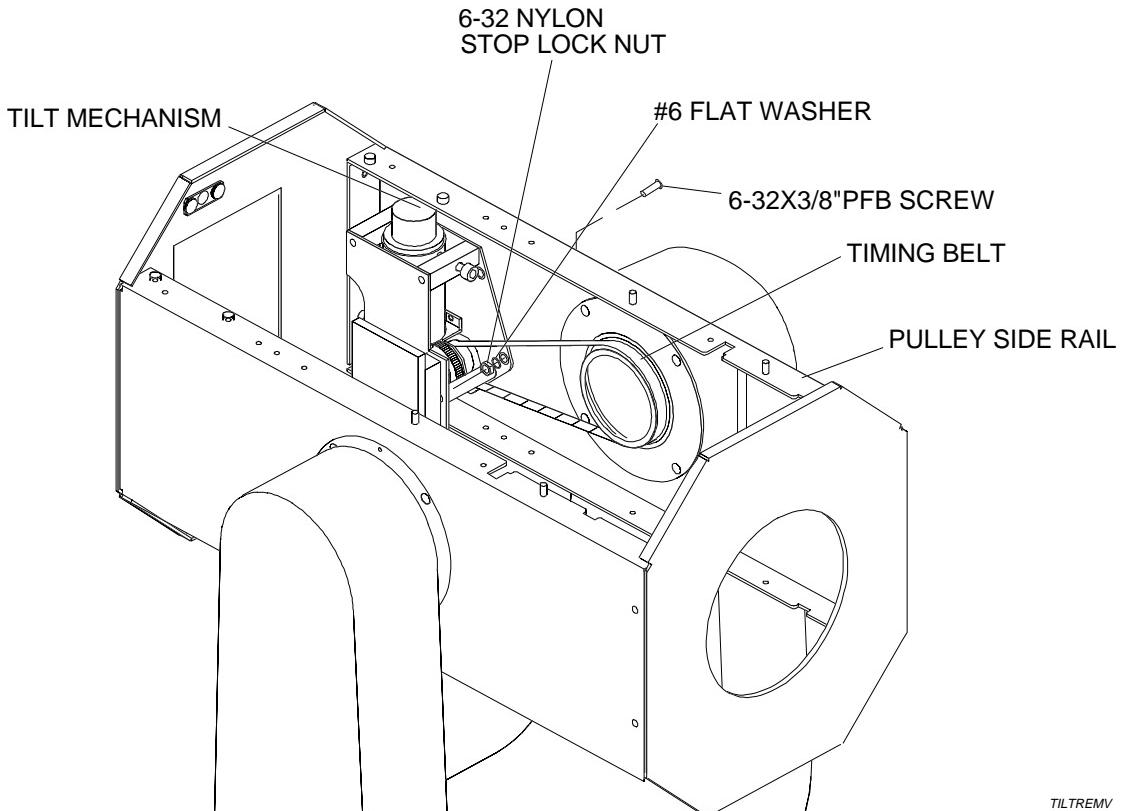
- Step 11. Remove tilt mechanism.
- At rear cover, remove 8-32x1"PPB tilt mechanism adjustment screw and #8 black flat washer.
  - At pulley side rail, remove three 6-32x3/8"PFB screws, #6 flat washers, and 6-32 KEPS nuts that secure tilt mechanism to pulley side rail.

---

**CAUTION:** Do NOT remove tilt flange (bushing).

---

- c. Remove timing belt from tilt pulley, pull tilt mechanism bushing from pulley side rail, and remove tilt mechanism (**Figure 3-25**).



TILTREMV

**Figure 3-25. Tilt Mechanism Removal and Replacement**

- Step 12. Prepare and install replacement tilt mechanism.
- a. At replacement tilt mechanism, using syringe, apply small amount of Versilube to worm gear. Put on only enough Versilube to gently coat meshing surfaces.
  - b. At replacement tilt mechanism, place timing belt over tilt pulley.
  - c. At tilt mechanism bottom plate, secure tilt mechanism to pulley side rail using three 6-32x3/8"PFB screws, #6 flat washers, and 6-32 nylon stop lock nuts.

---

**CAUTION:** To ensure proper operation of tilt mechanism, after tightening all screws that secure tilt mechanism to tilt side rail, loosen these screws by 1/4 turn.

---

- d. At rear cover, insert 8-32x1"PPB tilt mechanism adjustment screw thru #8 black flat washer and insert into tilt mechanism.

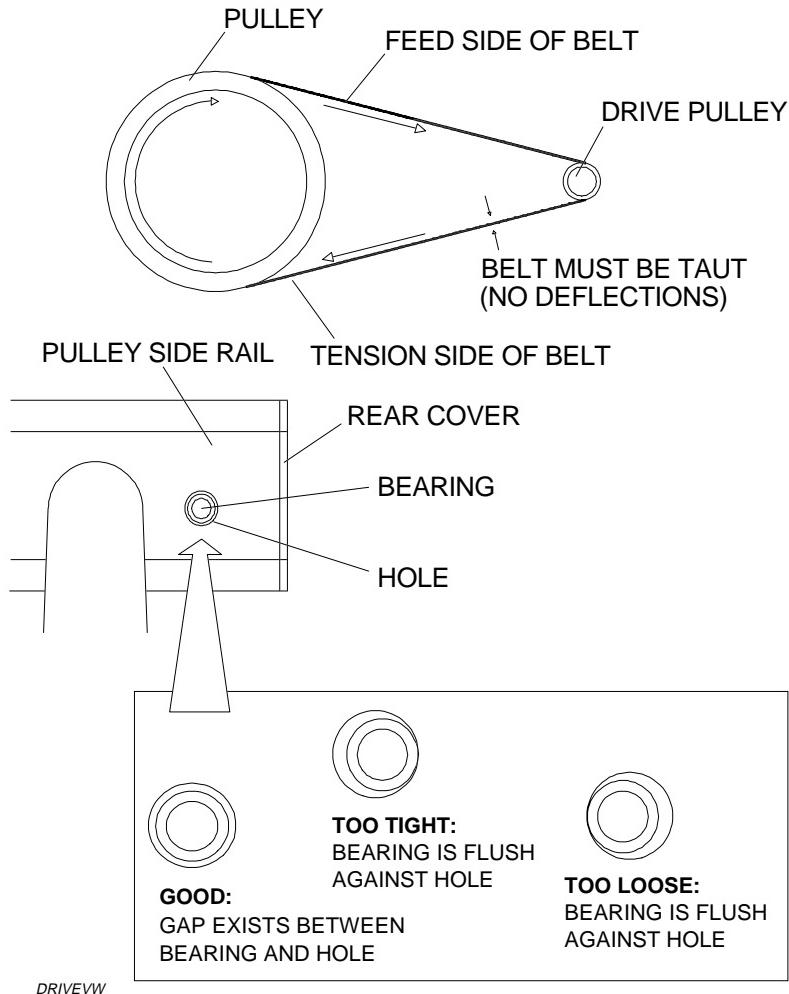
---

**CAUTION:** It is essential that tilt mechanism belt be adjusted correctly. Overtightening belt can cause high failure rate.

---

Step 13. Adjust belt tension.

- Tighten belt adjustment screw and then check tension of belt (**Figure 3-26**).



**Figure 3-26. Tilt Mechanism Adjustment Screw Setting**

- Turn head so that pulleys rotate back and forth. At same time, slowly tighten adjustment screw until both tension and feed sides of belt are taut (no deflections).

Step 14. Complete tilt mechanism replacement by doing Steps 2 thru 11 in reverse.

### 3.3.5 Electronics Chassis Maintenance

#### 3.3.5.1 Arc Power Supply Removal and Replacement

**Parts:**

1 EA ASSY, ARC PWR SUPPLY+ 400WATT (VL4)  
(21.9628.0020)

**Tools:**

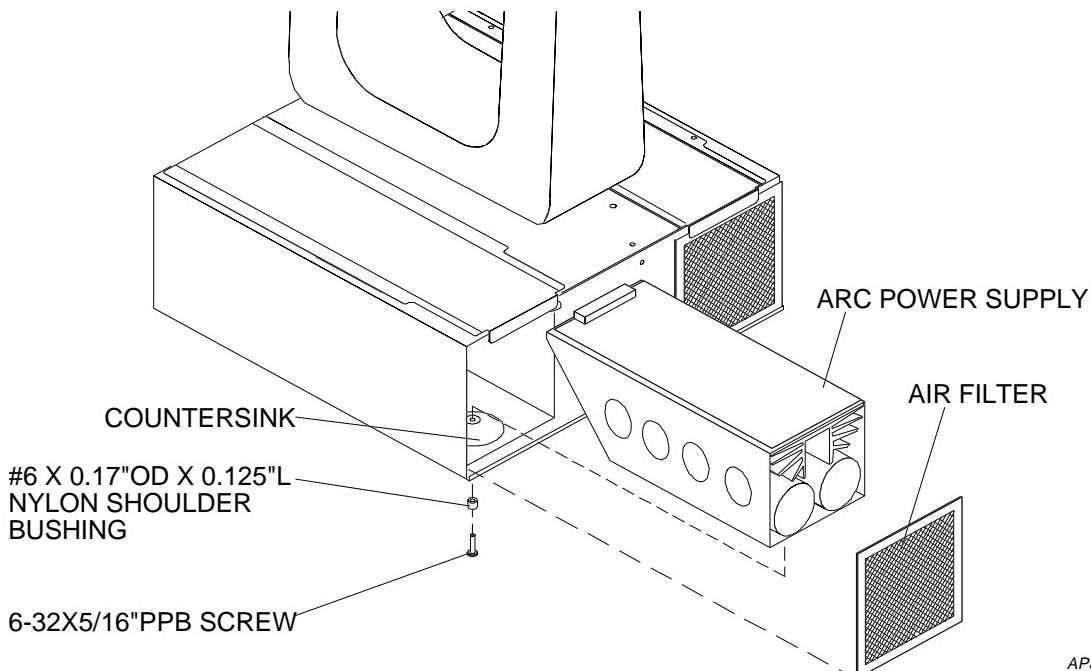
Screwdriver, Phillips #1  
Screwdriver, Phillips #2

**To remove and replace arc power supply plus:**

- Step 1. Remove power to luminaire.
- Step 2. At left electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filter.
- Step 3. Remove power supply.
  - a. At bottom of chassis, in countersink, remove 6-32x5/16" PPB screw and shoulder bushing (washer) securing power supply (**Figure 3-27**).
  - b. Remove power supply by sliding out.

**CAUTION:** Ensure that shoulder bushing is in place, failure to re-install will cause comm problems.

- Step 4. Replace power supply by doing Steps 2 and 3 in reverse.



APSTB1

**Figure 3-27. Arc Power Supply Plus Removal and Replacement**

### 3.3.5.2 Voltage Selector PCB Removal and Replacement

**Parts:**

1 EA PCB ASSY, VL4 VOLTAGE SELECTOR (VSB)  
(24.9628.0026)

**Tools:**

Screwdriver, Phillips #1  
Screwdriver, Phillips #2

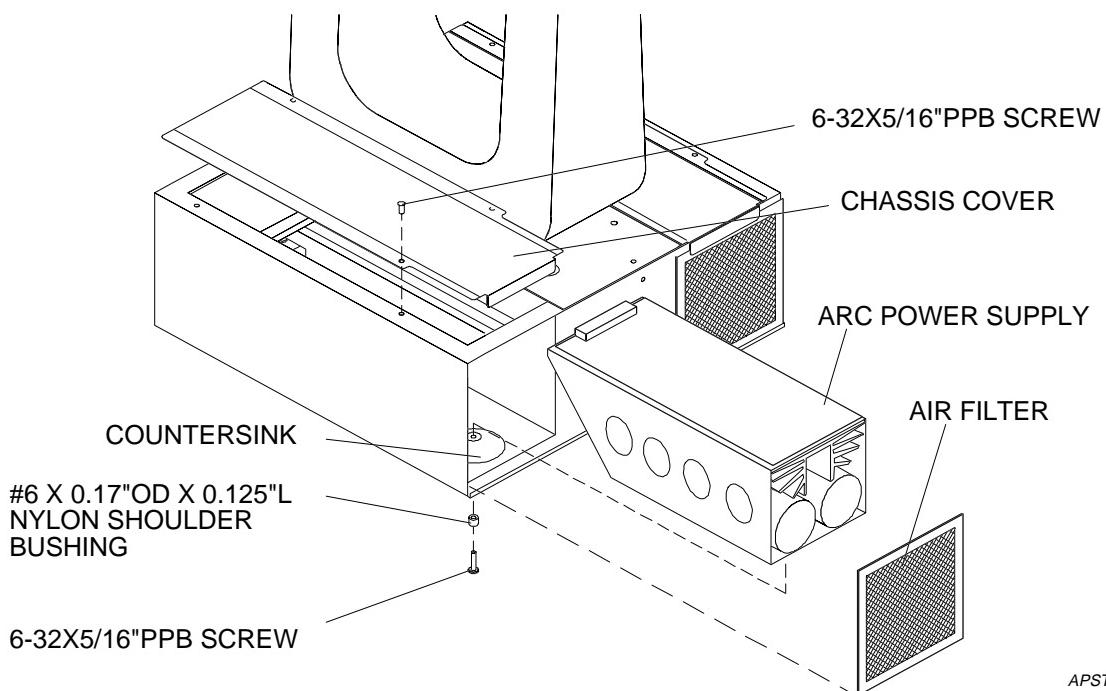
**To remove and replace voltage selector PCB:**

Step 1. Remove power to luminaire.

Step 2. Remove left air filter and left chassis cover.

- a. At left electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filter.
- b. Remove four 6-32x5/16"PPB screws that secure left top cover to chassis and remove cover (**Figure 3-28**).

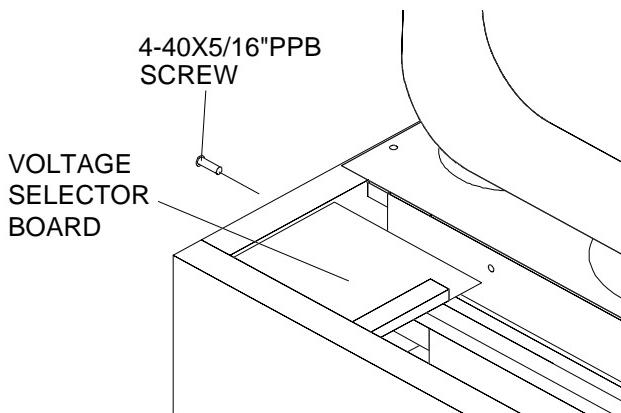
Step 3. Remove arc power supply.



**Figure 3-28. Cover and Power Supply Removal and Replacement**

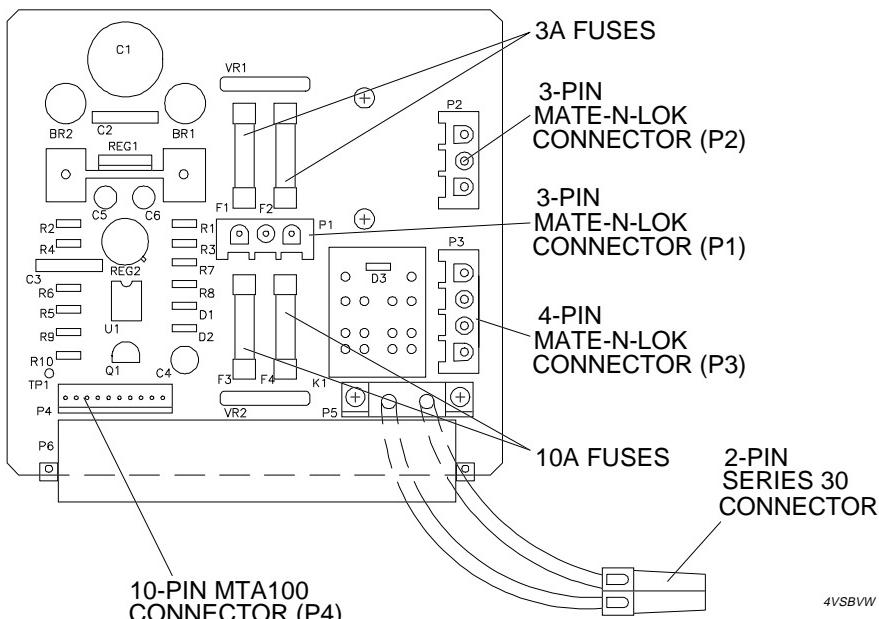
Step 4. Remove voltage selector PCB.

- At VSB, from outside of chassis, remove 4-40x5/16"PPB screw that secures PCB to chassis (**Figure 3-29**).



**Figure 3-29. Voltage Selector PCB Removal and Replacement**

- Disconnect the following connectors from top of voltage selector PCB (**Figure 3-30**):
  - 3-pin MATE-N-LOK connector from P2.
  - 4-pin MATE-N-LOK connector from P3.
  - 3-pin MATE-N-LOK connector from P1.
  - 12-pin MTA connector from P4.
- At bottom of VSB, disconnect red, 2-pin connector and remove PCB.



4VSBVW

**Figure 3-30. Voltage Selector PCB Parts Location**

Step 5. Replace voltage selector PCB by doing Steps 2 thru 4 in reverse.

---

### 3.3.5.3 Voltage Selector PCB Fuses Removal and Replacement

**Parts:**

- 1 EA    FUSE, 10AMP, 250V (70.3723.0001)  
1 EA    FUSE, 3A, 250V, 5X20MM, GLASS (70.3723.0003)

**Tools:**

- Screwdriver, Phillips #1  
Screwdriver, Phillips #2

**To remove and replace voltage selector PCB fuses:**

- Step 1. Remove power to luminaire.
- Step 2. Remove voltage selector PCB (**Figure 3-29**).
- Step 3. Remove blown 3A or 10A fuses (**Figure 3-30**).
- Step 4. Replace fuses and re-install voltage selector PCB by doing Steps 2 and 3 in reverse.

### 3.3.5.4 Low Voltage Supply and Universal Control PCB Removal and Replacement

**Parts:**

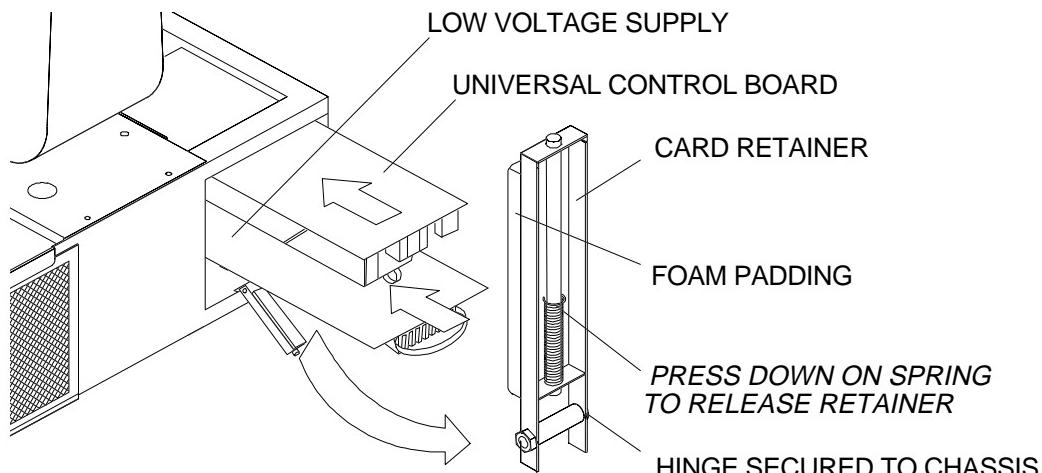
- 1 EA PCB ASSEMBLY, VL4 LOW VOLTAGE SUPPLY (LVS)  
(24.9628.0045)  
1 EA ELEC. ASSY, VL4 LAMP CTRL (UCB/IFB) (23.9628.0232)

**Tools:**

- Screwdriver, Phillips #1  
Screwdriver, Phillips #2

**To remove and replace low voltage supply or universal control PCB:**

- Step 1. Remove power to luminaire.
- Step 2. At right electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filter.
- Step 3. Remove faulty PCB (**Figure 3-31**).
  - a. At card retainer, press down on spring release and open retainer.
  - b. Pull out faulty PCB.
- Step 4. Replace faulty PCB by doing Steps 2 thru 3 in reverse.



**Figure 3-31. Low Voltage Supply and Universal Control PCB Removal and Replacement**

---

### 3.3.5.5 Motherboard Removal and Replacement

**Parts:**

1 EA PCB ASSY, VL4 MOTHER (MBD) (24.9628.0053)

**Tools:**

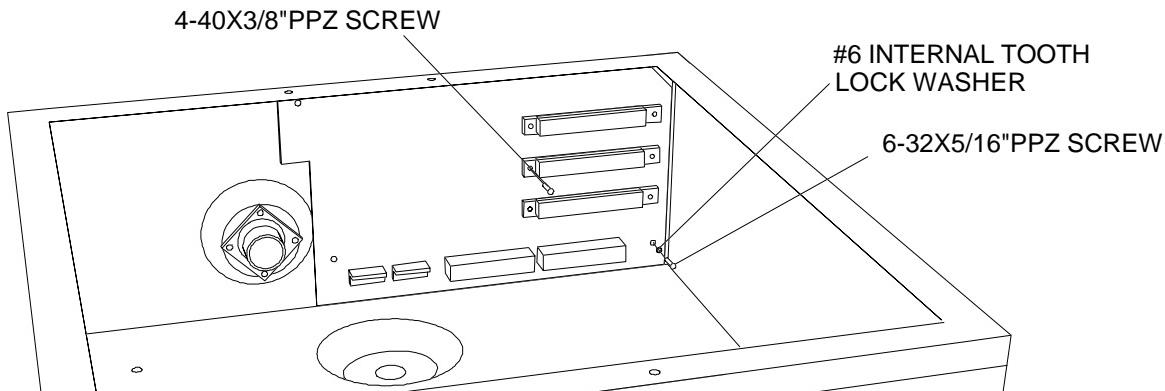
Screwdriver, Phillips #1

Screwdriver, Phillips #2

**To remove and replace motherboard:**

- Step 1. Remove power to luminaire.
- Step 2. Remove both air filters and chassis covers.
  - a. At each electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filters.
  - b. Remove eight 6-32x5/16"PPB screws that secure two top covers to chassis and remove covers.
- Step 3. Remove low voltage supply and universal control PCBs (**Figure 3-31**).
  - a. At card retainer, press down on spring release and open retainer.
  - b. Pull out low voltage power supply PCB and universal control PCB.
- Step 4. Remove power supply.
  - a. At bottom of chassis, in countersink, remove 6-32x5/16"PPB screw securing power supply (**Figure 3-27**).
  - b. Pull out power supply.
- Step 5. Remove voltage selector PCB (**Figure 3-29**).
- Step 6. Remove yoke bearing frame.
  - a. At yoke bearing frame, remove four 6-32x5/16"PPB screws that secure frame to flanges on top of chassis.
  - b. At bottom of chassis, remove five or six 6-32x5/16"PPB screws that secure yoke bearing frame to chassis bottom (depending on year of manufacture, luminaire was constructed with either five or six bottom retaining screws).
  - c. Pivot end of yoke bearing frame closest to transformer away from transformer and disconnect 8-pin MTA connector from motherboard header marked MB-P7.

- d. While holding up luminaire head with one hand, reach under yoke bearing and disconnect black, 26-pin connector from motherboard marked YOKE A MB-P4. Connector is located next to connector marked YOKE B.
  - e. At rear of chassis, behind power supply, disconnect 26-pin black connector from motherboard header marked YOKE B MB-P5.
  - f. Remove yoke bearing frame from chassis.
- Step 7. Remove motherboard.
- a. At bottom left corner of motherboard, disconnect 5-pin MTA connector from header marked DATA MB-P9.
  - b. At upper left of motherboard, disconnect 12-pin MTA connector from header marked LVPS VIA VSB MB-P6.
  - c. At bottom right of motherboard, disconnect 4-pin MATE-N-LOK connector from header marked UNREG. DC MB-P8.
  - d. At motherboard corners, remove three 6-32x5/16"PPZ screws and #6 internal tooth lockwashers (**Figure 3-32**).
  - e. At P1, P2, and P3 connector headers, remove total of six 4-40x3/8"PPZ screws that secure motherboard to chassis and remove motherboard.



**Figure 3-32. Motherboard Removal and Replacement**

- Step 8. Replace motherboard by doing Steps 2 thru 7 in reverse.

---

### 3.3.5.6 Pan Drive Assembly Removal and Replacement

**Parts:**

1 EA ASSY, PAN DRIVE (VL4) (22.4001.0001)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Nutdriver, 3/8 inch

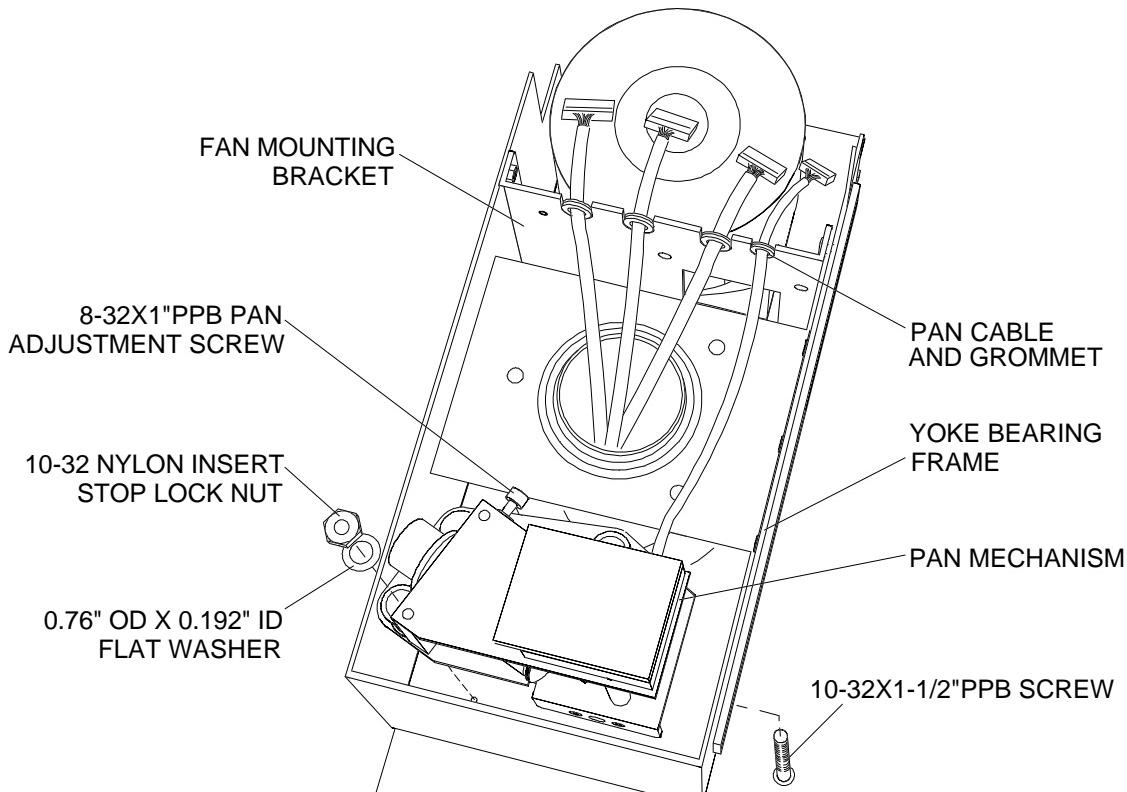
**To remove and replace pan drive assembly:**

- Step 1. Remove power to luminaire.
- Step 2. Remove both air filters and chassis covers.
  - a. At each electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filters.
  - b. Remove eight 6-32x5/16"PPB screws that secure two top covers to chassis and remove covers.
- Step 3. Remove low voltage supply and universal control PCBs (**Figure 3-31**).
  - a. At card retainer, press down on spring release and open retainer.
  - b. Pull out low voltage power supply PCB and universal control PCB.
- Step 4. Remove power supply.
  - a. At bottom of chassis, in countersink, remove 6-32x5/16" PPB screw securing power supply (**Figure 3-27**).
  - b. Pull out power supply.
- Step 5. Remove voltage selector PCB (**Figure 3-29**).
- Step 6. Remove yoke bearing frame.
  - a. At yoke bearing frame, remove four 6-32x5/16"PPB screws that secure frame to flanges on top of chassis.
  - b. At bottom of chassis, remove five or six 6-32x5/16"PPB screws that secure yoke bearing frame to chassis bottom (depending on year of manufacture, luminaire was constructed with either five or six bottom retaining screws).
  - c. Pivot end of yoke bearing frame closest to transformer away from transformer and disconnect 8-pin MTA connector from motherboard header marked MB-P7.

- d. While holding up luminaire head with one hand, reach under yoke bearing and disconnect black, 26-pin connector from motherboard marked YOKE A MB-P4. Connector is located next to connector marked YOKE B.
- e. At rear of chassis, behind power supply, disconnect 26-pin black connector from motherboard header marked YOKE B MB-P5.
- f. Remove yoke bearing frame from chassis.

**Step 7.** Remove pan assembly.

- a. At bottom of yoke bearing frame, remove pan assembly wires and grommet from grommet slot (**Figure 3-33**).



**Figure 3-33. Pan Mechanism Removal and Replacement**

**Note:** Belt is not removed with pan drive assembly.

- b. At side of yoke bearing frame, remove 8-32x1"PPB pan assembly belt adjustment screw.
- c. At bottom of yoke bearing frame, while holding 10-32 nylon insert lock nuts with 3/8 inch nutdriver, remove three 10-32x1-1/2"PPB screws from top of yoke bearing frame. Remove 10-32 nuts and 0.75"ODx0.192"ID flat washers from bottom of frame and remove pan assembly.

**Step 8.** Replace pan assembly by doing Steps 2 thru 7 in reverse.

### 3.3.5.7 Transformer Assembly Removal and Replacement

**Parts:**

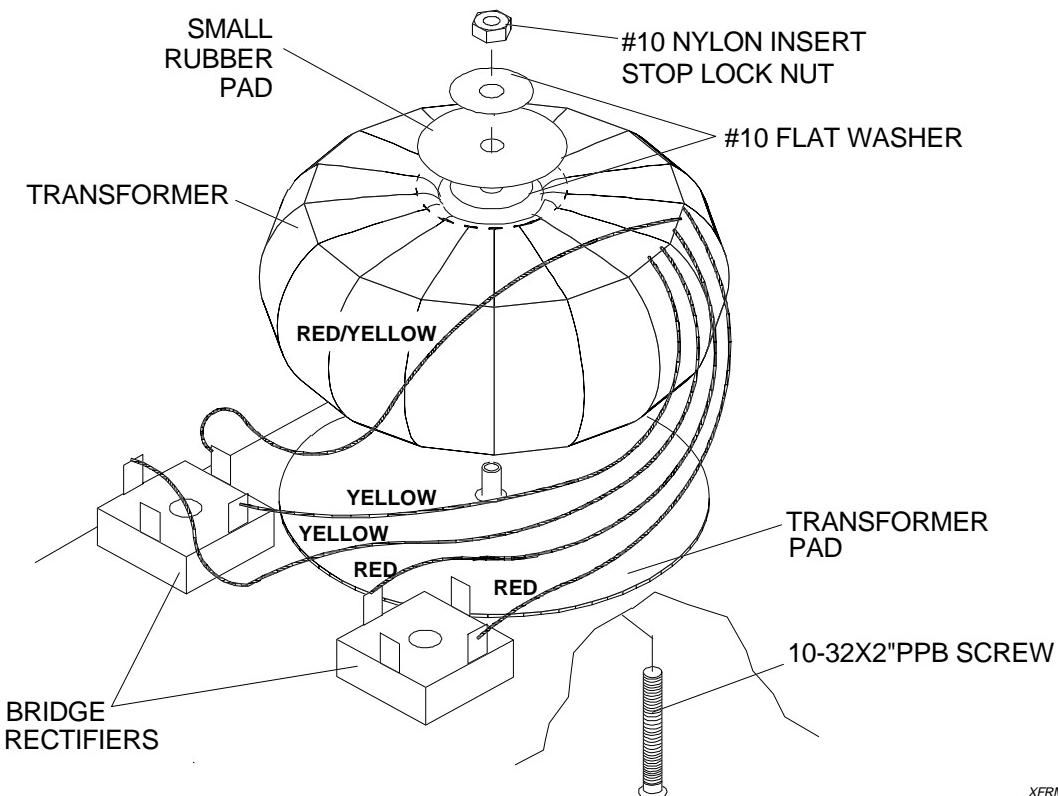
1 EA ASSY, CONNECTORIZED TRANSFORMER (VL4)  
(23.9628.0159)

**Tools:**

Screwdriver, Phillips #1  
Screwdriver, Phillips #2

**To remove and replace transformer assembly:**

- Step 1. Remove power to luminaire.
- Step 2. Remove voltage selector PCB (**Figure 3-29**).
- Step 3. Disconnect bridge rectifier transformer wire spade connectors.
  - a. At transformer orange and yellow wires, using diagonal cutters, remove cable ties securing wires together.
  - b. At bridge rectifier transformer wires, disconnect two red, two yellow, and one red/yellow wire spade connectors (**Figure 3-34**).



XFRMRVW

**Figure 3-34. Transformer Assembly Removal and Replacement**

Step 4. Remove transformer assembly.

- a. At transformer assembly, using 3/8 inch nutdriver, remove 10-32 nylon insert stop lock nut and 10-32x2"PPB screw securing transformer to chassis bottom.
- b. Remove #10 flat washer from top of rubber pad, rubber pad, and second #10 flat washer from top of transformer.
- c. Remove transformer assembly from chassis.

Step 5. Replace transformer/capacitor assembly by doing Steps 2 thru 4 in reverse.

---

### 3.3.5.8 Mounted Capacitor Removal and Replacement

**Parts:**

1 EA ASSY, MOUNTED CAPACITOR (VL4) (23.9628.0234)

**Tools:**

Screwdriver, Phillips #1 and #2

Screwdriver, slotted #2

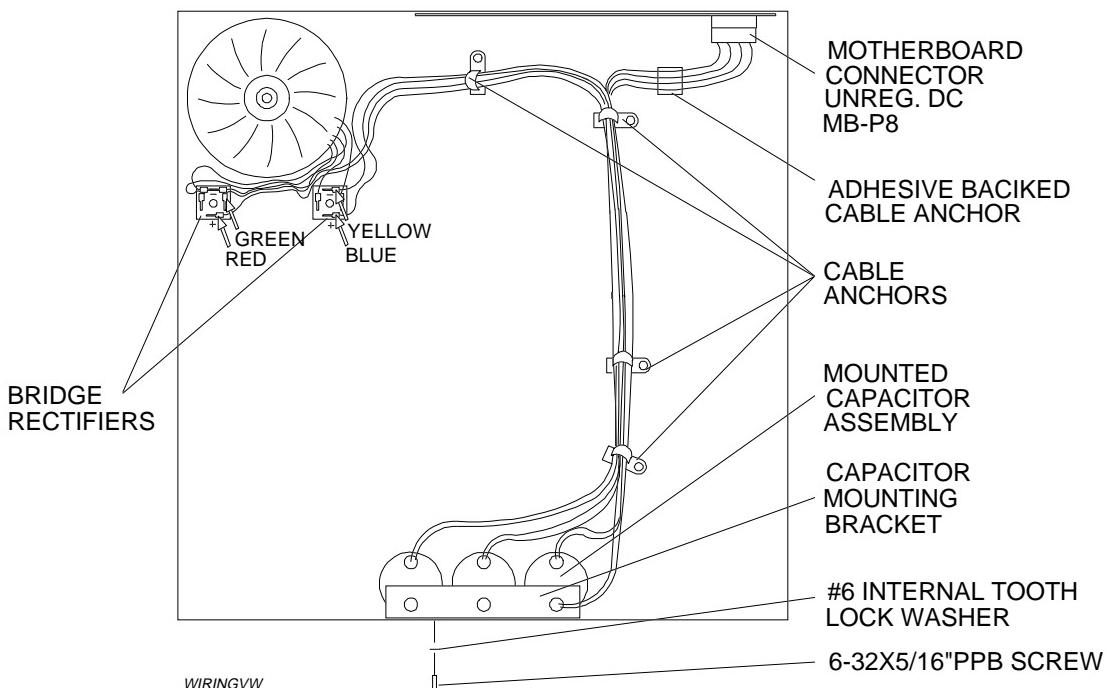
Cutters, diagonal

**To remove and replace mounted capacitor assembly:**

- Step 1. Remove power to luminaire.
- Step 2. Remove both air filters and chassis covers.
  - a. At each chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filters.
  - b. Remove eight 6-32x5/16"PPB screws that secure two top covers to chassis and remove covers.
- Step 3. Remove low voltage supply and universal control PCBs (**Figure 3-31**).
  - a. At card retainer, press down on spring release and open retainer.
  - b. Pull out low voltage power supply PCB and universal control PCB.
- Step 4. Remove power supply.
  - a. At bottom of chassis, in countersink, remove 6-32x5/16" PPB screw securing power supply (**Figure 3-27**).
  - b. Pull out power supply.
- Step 5. Remove voltage selector PCB (**Figure 3-29**).
- Step 6. Remove yoke bearing frame.
  - a. At yoke bearing frame, remove four 6-32x5/16"PPB screws that secure frame to flanges on top of chassis.
  - b. At bottom of chassis, remove five or six 6-32x5/16"PPB screws that secure yoke bearing frame to chassis bottom (depending on year of manufacture, luminaire was constructed with either five or six bottom retaining screws).
  - c. Pivot end of yoke bearing frame closest to transformer away from transformer and disconnect 8-pin MTA connector from motherboard header marked MB-P7.

- d. While holding up luminaire head with one hand, reach under yoke bearing and disconnect black, 26-pin connector from motherboard marked YOKE A MB-P4. (Connector is located next to connector marked YOKE B.)
- e. At rear of chassis, behind power supply, disconnect 26-pin black connector from motherboard header marked YOKE B MB-P5.
- f. Remove yoke bearing frame from chassis.

- Step 7. Remove mounted capacitor assembly.
- a. At chassis bottom, using diagonal cutters, remove cable ties securing capacitor assembly to five cable anchors (**Figure 3-35**).
  - b. At bottom right corner of motherboard, disconnect 4-pin MATE-N-LOK connector from header marked UNREG. DC MB-P8.
  - c. At bridge rectifiers, disconnect red, green, blue, and yellow mounted capacitor assembly spade connectors.
  - d. At capacitor bracket, remove two 6-32x5/16"PPB screws and #6 lock washers that secure bracket to chassis.



**Figure 3-35. Mounted Capacitor Assembly Removal and Replacement**

---

**Note:** Capacitors are secured to chassis side with RTV.

---

- e. Using slotted screwdriver or other flat sharp instrument, carefully pry capacitor assembly from chassis side and remove from chassis.
- Step 8. Replace mounted capacitor assembly by doing Steps 2 thru 7 in reverse.

### **3.3.5.9 APS Control PCB Resistor/Diode Removal and Replacement (*Shop Only*)**

## Parts:

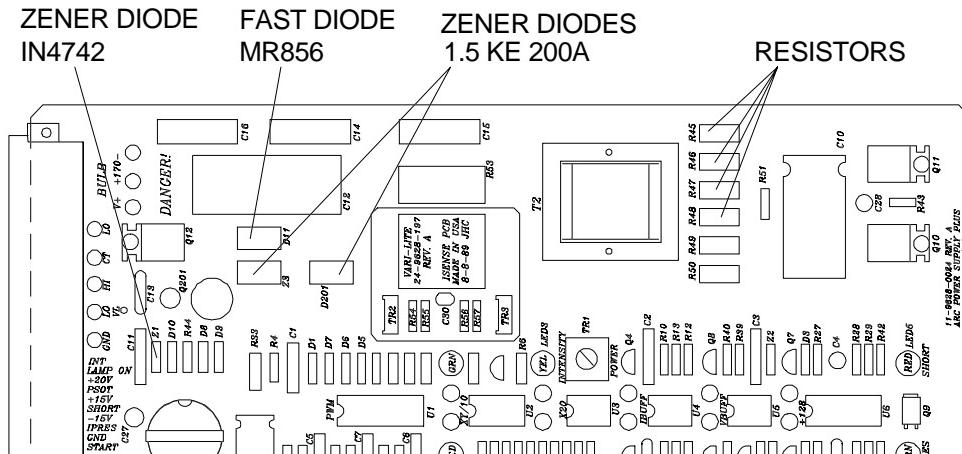
- 1 EA DIODE, FAST, MR856, 600V 3A (82.4304.0856)  
1 EA DIODE, ZENER TS, 1.5KE200 200V, 5W (82.5301.0303)  
1 EA DIODE, ZENER, 1N4742 12V 1W (82.5304.4742)  
1 EA RES, 1W 5%, 4.7OHM, MET OXIDE (60.3430.0047)

## Tools:

- Screwdriver, Phillips #2  
Screwdriver, Phillips #1  
Soldering iron  
Solder sucker  
Solder, regular

**To remove and replace APS switch PCB diodes or resistors:**

- Step 1. Remove power to luminaire.
  - Step 2. Remove power supply (**Figure 3-27**).
  - Step 3. Separate heatshrink from power supply chassis.
    - a. At power supply control PCB, remove four 6-32x3/4"PPZ screws that secure heatsink assembly to power supply chassis.
    - b. Gently pry apart sides of power supply chassis and remove heatsink.
  - Step 4. Replace faulty resistor or diode.
    - a. Locate resistor or diode to be replaced (**Figure 3-36**).
    - b. Unsolder faulty resistor or diode.



**Figure 3-36. APS Control PCB Diodes and Resistor Removal and Replacement**

- Step 5. Replace resistor or diode by doing Steps 2 thru 4 in reverse.

---

**3.3.5.10 APS MJ10005 and IRF450 Transistor Removal and Replacement (*Shop Only*)****Parts:**

- |      |  |
|------|--|
| 1 EA | TRANSISTOR, MJ10005 NPN 400V 20A TO3<br>(80.1612.1005) |
| 1 EA | TRANSISTOR, IRF450 NCH500V 10A TO3 (80.1610.0450)      |
| 1 EA | INSULATOR, TO-3 (51.5005.0001)                         |

**Tools:**

Screwdriver, Phillips #2

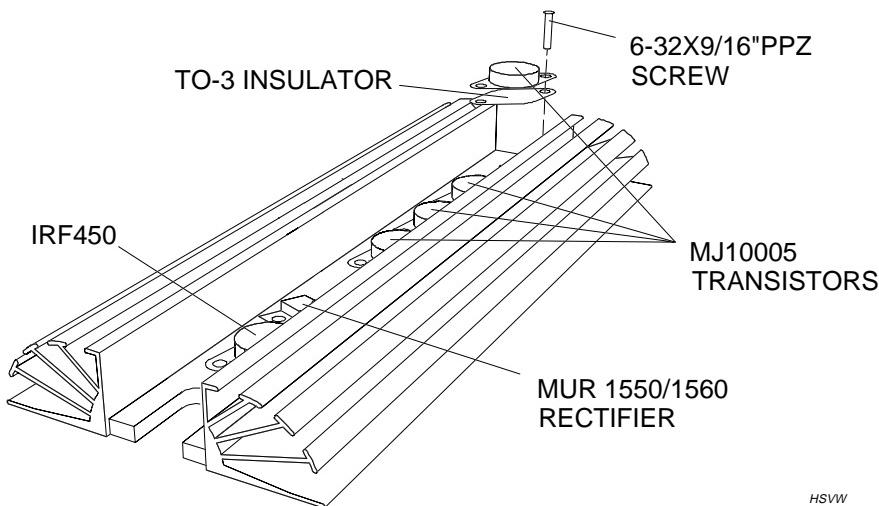
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**Notes:**

1. IRF452 field-effect transistors (FETs) may have been used instead of IRF450 FETs. When replacing IRF452 FET, either replacement FET may be used, as available.
  2. Verify that replacement IRF450 FETs are manufactured by Motorola, GE, or RCA. FETs manufactured by International Rectifiers (IR) should not be used and returned to the shop.
- 

**To remove and replace APS heatsink assembly MJ10005 transistor or IRF450 FET:**

- Step 1. Remove power to luminaire.
- Step 2. Remove power supply (**Figure 3-27**).
- Step 3. Separate heatshrink from power supply chassis.
  - a. At power supply control PCB, remove four 6-32x3/4"PPZ screws that secure heatsink assembly to power supply chassis.
  - b. Gently pry apart sides of power supply chassis and remove heatsink.
- Step 4. Remove faulty transistor or FET.
  - a. At faulty transistor or FET (**Figure 3-37**), remove two 6-32x9/16"PPZ screws that secure transistor to heat sink and remove transistor or FET and TO-3 insulator.



**Figure 3-37. APS Plus MJ10005 and IRF450 FET Removal and Replacement**

Step 5. Replace transistor or FET.

- a. At rear of replacement transistor or FET, apply new TO-3 insulator.
- b. Replace transistor or FET by doing Steps 2 thru 4 in reverse.

---

### 3.3.5.11 Input Connector Removal and Replacement

**Parts:**

1 EA RECEPT, 9POS, CHASSIS MNT LAMP (52.6251.0001)

**Tools:**

Screwdriver, Phillips #1

Screwdriver, Phillips #2

Extractor tool, pin

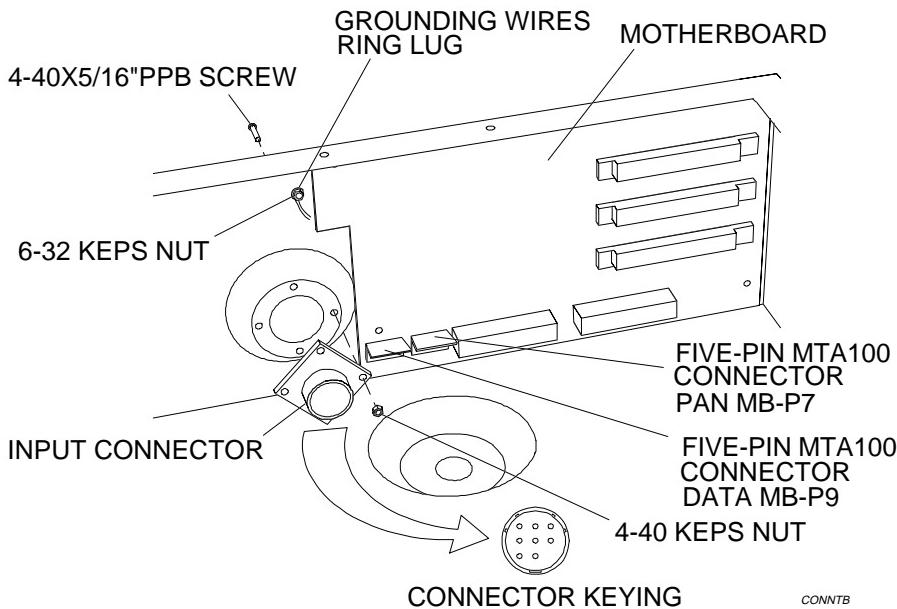
**To remove and replace input connector:**

- Step 1. Remove power to luminaire.
- Step 2. Remove both air filters and chassis covers.
  - a. At each electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filters.
  - b. Remove eight 6-32x5/16"PPB screws that secure two top covers to chassis and remove covers.
- Step 3. Remove low voltage supply and universal control PCBs (**Figure 3-31**)..
  - a. At card retainer, press down on spring release and open retainer.
  - b. Pull out low voltage power supply PCB and universal control PCB.
- Step 4. Remove power supply.
  - a. At bottom of chassis, in countersink, remove 6-32x5/16" PPB screw securing power supply (**Figure 3-27**).
  - b. Pull out power supply.
- Step 5. Remove voltage selector PCB (**Figure 3-29**).
- Step 6. Remove yoke bearing frame.
  - a. At yoke bearing frame, remove four 6-32x5/16"PPB screws that secure frame to flanges on top of chassis.
  - b. At bottom of chassis, remove five or six 6-32x5/16"PPB screws that secure yoke bearing frame to chassis bottom (depending on year of manufacture, luminaire was constructed with either five or six bottom retaining screws).
  - c. Pivot end of yoke bearing frame closest to transformer away from transformer and disconnect 8-pin MTA connector from motherboard header marked MB-P7.

- d. While holding up luminaire head with one hand, reach under yoke bearing and disconnect black, 26-pin connector from motherboard marked YOKE A MB-P4. Connector is located next to connector marked YOKE B.
- e. At rear of chassis, behind power supply, disconnect 26-pin black connector from motherboard header marked YOKE B MB-P5.
- f. Remove yoke bearing frame from chassis.

**Step 7. Remove input connector.**

- a. At bottom left of motherboard, disconnect 5-pin MTA connector from header DATA MB-P9 (**Figure 3-38**).



**Figure 3-38. Input Connector Removal and Replacement**

- b. At input connector, at outside of chassis, remove four 4-40x5/16"PPB screws and 4-40 KEPS nuts that secure square flange receptacle to chassis.
- c. At input connector green grounding wires, using 5/16 inch nutdriver, remove 6-32 KEPS nut and ring lug from PEM nut on rear of chassis.
- d. Using pin removal tool, remove pin contacts from faulty receptacle and remove receptacle.

Step 8. Prepare and install replacement input connector.

- a. At replacement receptacle, insert five 22 AWG wires and three 18 AWG wires using the following pinouts:

Pin	Wire	Wire Size	Description
1	N/C		
2	RED	22 AWG	BRDCST +
3	GRN	22 AWG	DATA GND
4	BLK	22 AWG	BRDCST -
5	GRY	22 AWG	REPLY -
6	WHT	22 AWG	REPLY +
7	WHT	18 AWG	NEUTRAL
8	GRN	18 AWG	GROUND
9	BLK	18 AWG	AC

- b. Complete receptacle replacement by doing Steps 2 thru 7 in reverse.

### 3.3.5.12 Stuck Truss Hook and Fastener Removal and Replacement

**Parts:**

- 1 EA ASSY,FASTENER,TRUSS HOOK (22.9637.0093)
- 2 EA RIVET, POP 1/8"ODX.313-.375 GR.LENGTH (53.6530.0003)
- 1 EA NUT, 5/16"-18 STEEL ZINC (53.2025.0001)
- 2 EA WASHER, 5/16"IDX7/8"OD FLAT STL Z TYPE B (55.6551.0001)
- 1 EA SCREW, 5/16-18X1"HCSZ GRADE 5 (53.7001.0003)

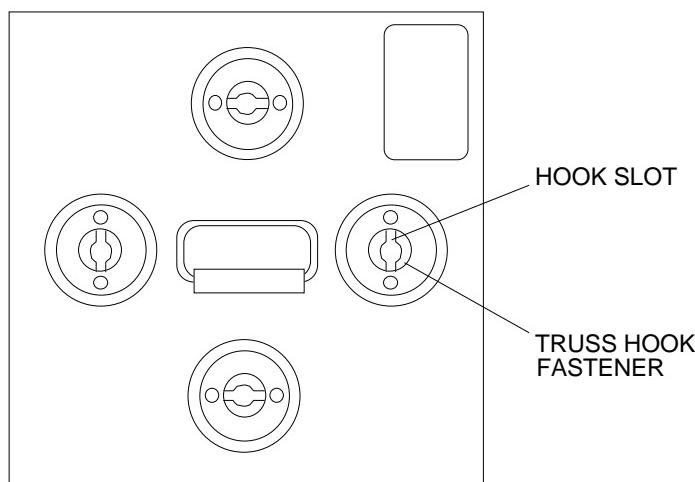
**Tools:**

- Screwdriver, Phillips #1 and #2
- Rivet gun
- Drill, hand with #30 (0.1285 inch) drill bit
- Center punch
- Glue

**Note:** This procedure only works with new Fastex truss hook fasteners.

**To remove stuck truss hook from luminaire and to remove and replace truss hook fastener:**

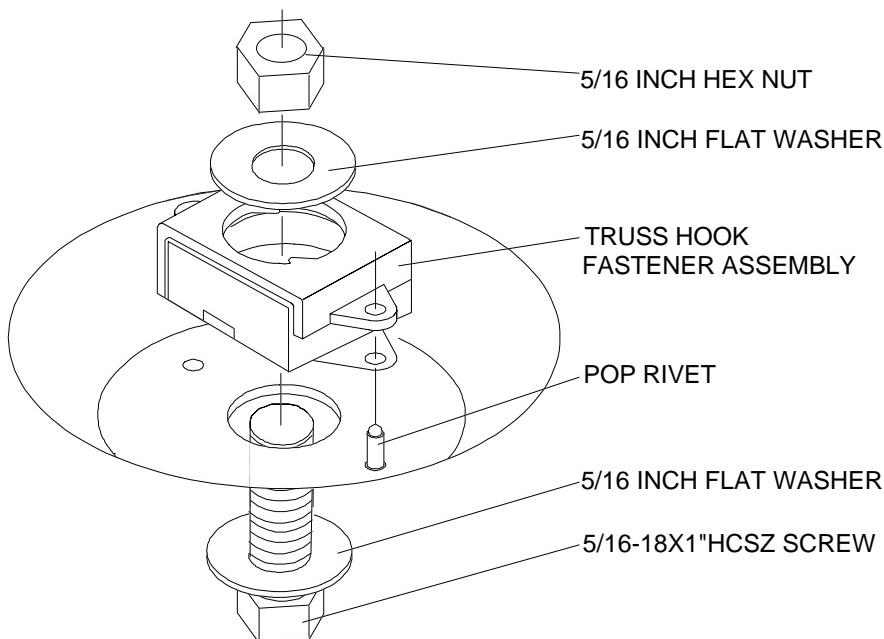
- Step 1. Remove power to luminaire.
- Step 2. Turn truss hook so that slot in pin head points toward edge of dimple in corresponding hook slot (**Figure 3-39**). This ensures that cross pins in truss hook are aligned with slots that are supposed to be in fastener.



**Figure 3-39. Proper Orientation of VL4 Truss Hook Fastener Slots**

- Step 3. Rock truss hook back and forth in direction parallel to corner of chassis. This allows cross pins in truss hook to bend tabs in fastener back to allow removal of hook. Push hard on truss hook to make this happen. Tabs in fastener are bent over and must be bent back into position to allow removal of hook.
- Step 4. When tabs are bent back into position, truss hook will come out.
- Step 5. Replace truss hook fastener.
  - a. For power supply side fastener, remove power supply (**Figure 3-27**).
  - b. For low voltage supply and universal control PCB side fastener, remove PCBs (**Figure 3-31**).
  - c. For other fasteners, remove yoke bearing frame by doing the following:
    1. At each electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and remove filters.
    2. Remove eight 6-32x5/16"PPB screws that secure two top covers to chassis and remove covers.
    3. At card retainer, press down on spring release and open retainer.
    4. Pull out low voltage power supply PCB and universal control PCB.
    5. At bottom of chassis, in countersink, remove 6-32x5/16"PPB screw securing power supply.
    6. Pull out power supply.
    7. Remove voltage selector PCB (**Figure 3-29**).
    8. At yoke bearing frame, remove four 6-32x5/16"PPB screws that secure frame to flanges on top of chassis.
    9. At bottom of chassis, remove five or six 6-32x5/16"PPB screws that secure yoke bearing frame to chassis bottom (depending on year of manufacture, luminaire was constructed with either five or six bottom retaining screws).
    10. Pivot end of yoke bearing frame closest to transformer away from transformer and disconnect eight-pin MTA connector from motherboard header marked MB-P7.
    11. While holding up luminaire head with one hand, reach under yoke bearing and disconnect both black, 26-pin connectors from motherboard marked YOKE A MB-P4 and YOKE B MB-P5.
    12. Remove yoke bearing frame from chassis.
- Step 6. At bottom of chassis, carefully peel off chassis foot cover covering damaged fastener and save chassis foot cover.

- Step 7. Using center punch, punch center of two rivets that secure damaged fastener and stop to chassis.
- Step 8. Using #30 drill bit and drill, drill out rivets.
- Step 9. Remove damaged fastener and stop.
- Step 10. Place replacement truss hook fastener assembly over rivet holes.
- Step 11. Place one 5/16" flat washer onto 5/16-18X1"HCSZ screw and insert screw and washer thru fastener assembly so that screw head is on outside of chassis (**Figure 3-40**). At other end of screw, install second flat washer on screw and firmly tighten nut onto screw. Screw will hold fastener assembly securely to chassis when installing pop rivets.



**Figure 3-40. Truss Hook Fastener Removal and Replacement**

- Step 12. From exterior of chassis bottom, using rivet gun, fasten two rivets thru truss hook fastener assembly.
- Step 13. Remove 5/16-18X1"HCSZ screw, two 5/16" flat washers and hex nut from fastener.
- Step 14. At chassis bottom, using glue, reinstall chassis foot cover over replaced fastener.
- Step 15. Re-assemble luminaire by doing Step 5 in reverse.

### 3.3.6 Yoke Cables Maintenance

#### 3.3.6.1 Yoke Cables and Lamp Wire Removal and Replacement

**Parts:**

- 1 EA CABLE ASSY, YOKE "A", 38" (VL4) (25.9628.0145)
- 1 EA CABLE ASSY, YOKE "B", 41" (VL4) (25.9628.0147)
- 1 EA LAMP WIRE ASSY, A & B (VL4) (25.9628.0149)

**Tools:**

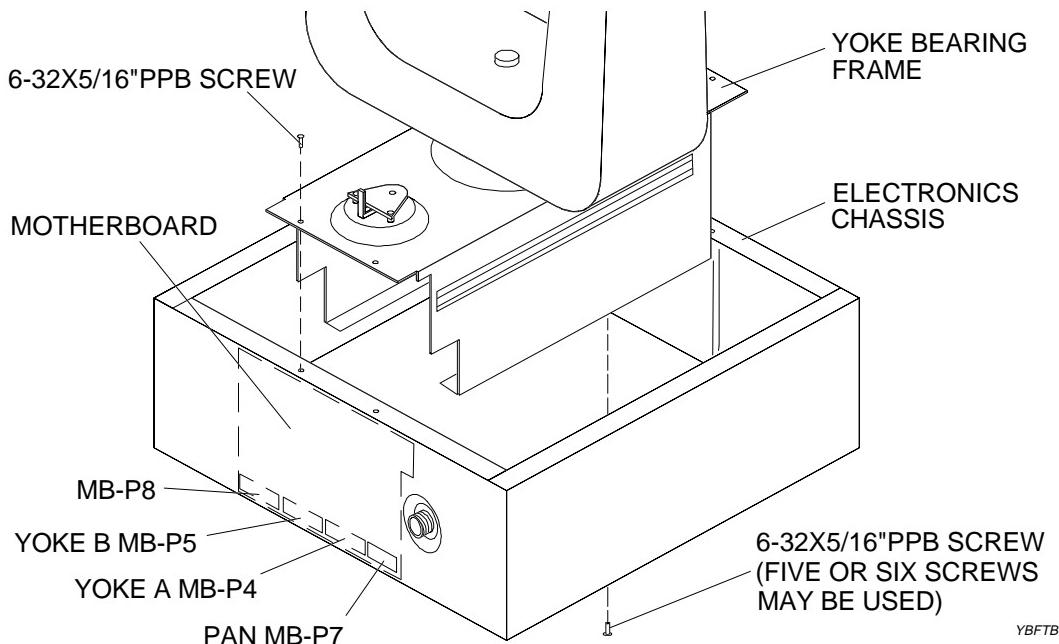
- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- Tape
- Cable tie, long length
- Nutdriver, 5/16 inch
- Diagonal cutters

**To remove and replace either yoke cable:**

- Step 1. Remove power to luminaires.
- Step 2. Remove 12, 6-32x5/16"PPB screws that secure head covers to rails and remove both head covers (**Figure 3-1**).
- Step 3. At yoke termination PCB, disconnect all connectors.
  - a. 4-pin connector from AMBER header marked YTB-P9.
  - b. 8-pin connector from AMBER header marked YTB-P8.
  - c. 4-pin connector from BLUE header marked YTB-P7.
  - d. 8-pin connector from BLUE header marked YTB-P6.
  - e. 4-pin connector from MAG header marked YTB-P11.
  - f. 8-pin connector from MAG header marked YTB-P10.
  - g. 4-pin connector from DOUSER header marked YTB-P5.
  - h. 5-pin connector from TILT header marked YTB-P3.
  - j. 4-pin connector from TILT header marked YTB-P4.
  - k. 4-pin connector from DIM header marked YTB-P13.
  - m. 8-pin connector from DIM header marked YTB-P12.
  - n. 4-pin connector from DIFF header marked YTB-P15.
  - o. 8-pin connector from DIFF header marked YTB-P14.
  - p. 8-pin connector from FOCUS header marked TB-P16.

- Step 4. Remove yoke termination PCB (**Figure 3-22**).
- Step 5. Remove lamp assembly.
  - a. At lamp assembly, turn 1/4-turn fasteners on rear of lamp assembly and carefully slide out lamp assembly from luminaire head (**Figure 3-19**).
- Step 6. At lamp carriage, squeeze and lift lamp retainer. Remove lamp from carriage.
- Step 7. Remove blue/amber bulkhead (**Figure 3-1**).
- Step 8. Remove dimmer/filter/douser assembly from luminaire head (**Figure 3-7**).
- Step 9. Remove ignitor PCB (**Figure 3-23**).
- Step 10. Remove cable side rail cover and cable tie that secures yoke cables.
  - a. At cable side rail cover, remove three 6-32x5/16"PPB screws that secure cable side rail cover to side rail and remove cover.
  - b. Using diagonal cutters, remove cable tie that secures three cables to cable side rail.
- Step 11. For removal of lamp wire only, at green grounding wires next to tilt tube, using 5/16 inch nutdriver, remove 6-32 KEPS nut and ring lug.
- Step 12. Remove both air filters and chassis covers.
  - a. At each electronics chassis air filter, while pressing down on filter, pop out top of filter from chassis and fully remove filters.
  - b. Remove eight 6-32x5/16"PPB screws that secure two top covers to chassis and remove covers.
- Step 13. Remove low voltage supply and universal control PCBs (**Figure 3-31**).
  - a. At card retainer, press down on spring release and open retainer.
  - b. Pull out low voltage supply PCB and universal control PCB.
- Step 14. Remove power supply.
  - a. At bottom of chassis, in countersink, remove 6-32x5/16"PPB screw securing power supply.
  - b. Pull out power supply.

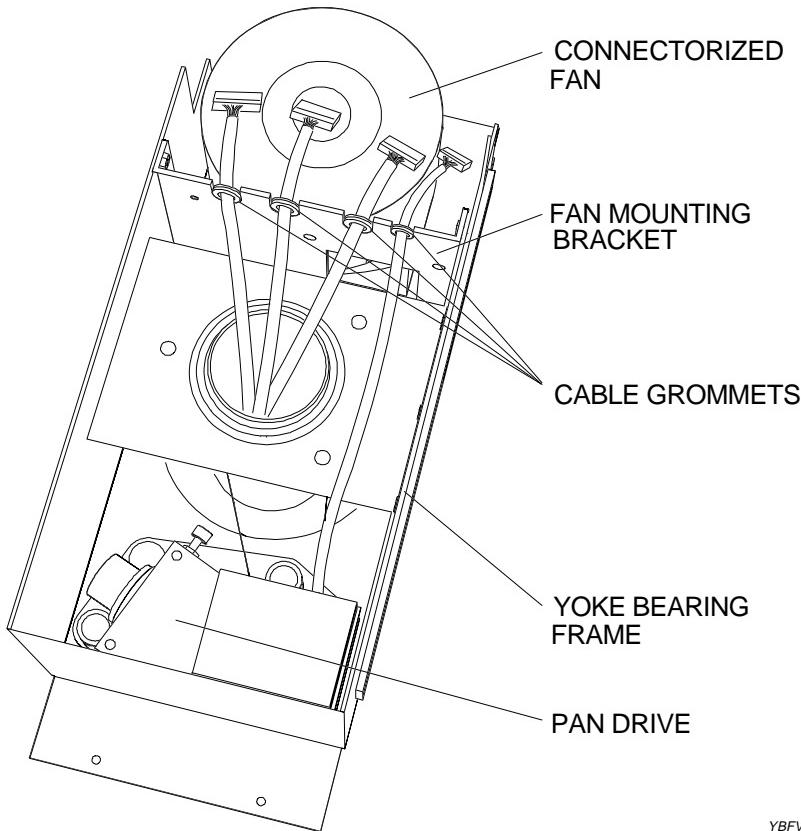
- Step 15. Remove voltage selector PCB (**Figure 3-29**).
- Step 16. Remove yoke bearing frame (**Figure 3-41**).
- At yoke bearing frame, remove four 6-32x5/16"PPB screws that secure frame to flanges on top of chassis.
  - At bottom of chassis, remove five or six 6-32x5/16"PPB screws that secure yoke bearing frame to chassis bottom (depending on year of manufacture, luminaire was constructed with either five or six bottom retaining screws).
  - Pivot end of yoke bearing frame closest to transformer away from transformer and disconnect 8-pin MTA connector from motherboard header marked MB-P7.
  - While holding up luminaire head with one hand, reach under yoke bearing and disconnect black, 26-pin connector from motherboard marked YOKE A MB-P4. Connector is located next to connector marked YOKE B.
  - At rear of chassis, behind power supply, disconnect 26-pin black connector from motherboard header marked YOKE B MB-P5.
  - Remove yoke bearing frame from chassis.



**Figure 3-41. Yoke Bearing Frame Removal and Replacement**

Step 17. Remove yoke cable or lamp wire.

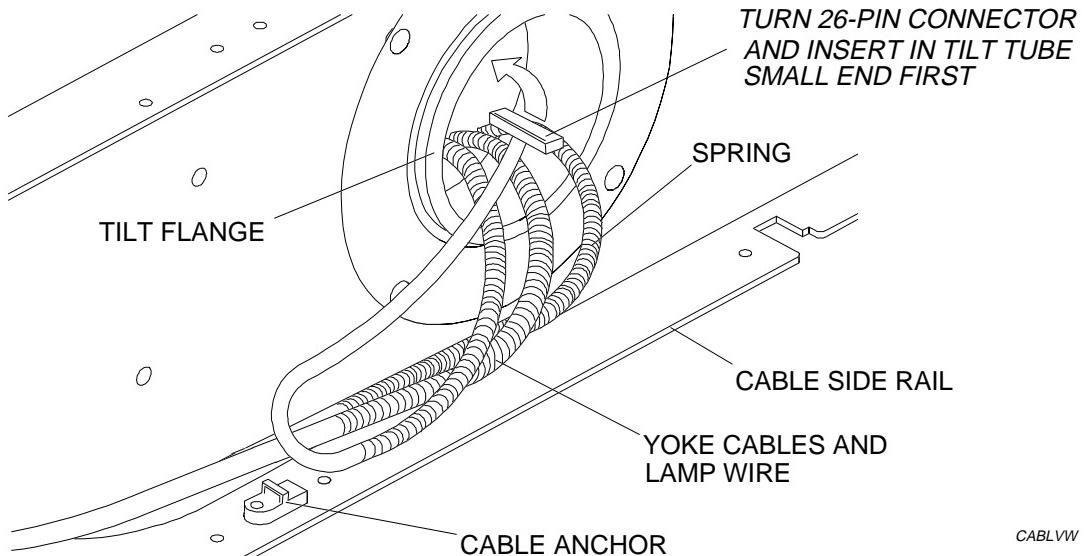
- a. For lamp wire replacement only, at fan mount, using 5/16 inch nutdriver, remove 6-32 KEPS nut and ring lug securing green grounding wires to fan mount.
- b. At yoke bearing frame, remove faulty yoke cable or lamp wire with grommet from grommet slot (**Figure 3-42**).



YBFVW

**Figure 3-42. Yoke Bearing Frame Base**

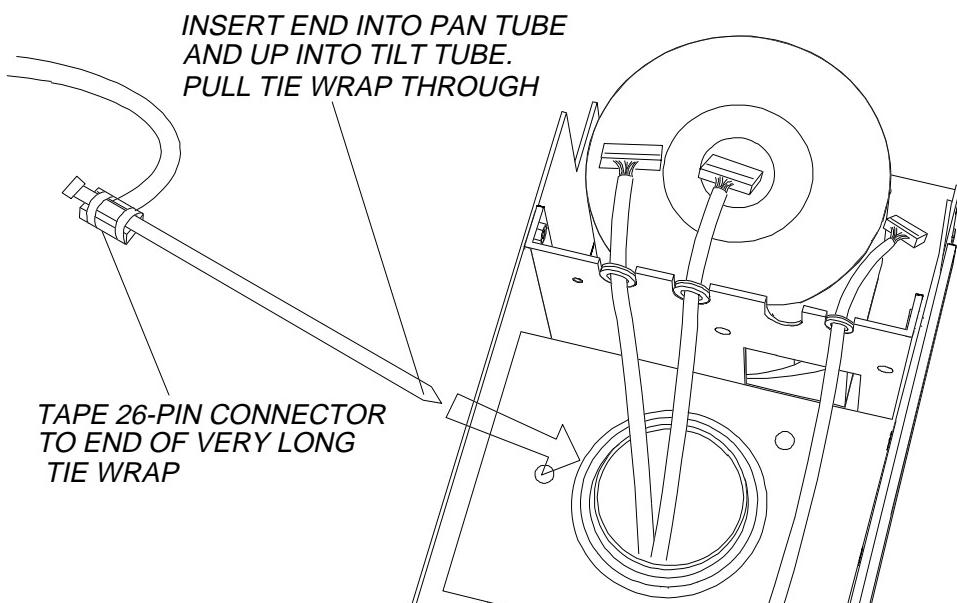
- c. At yoke cable connector in luminaire head, turn connector sideways and insert in tilt tube (**Figure 3-43**).
- d. From bottom of yoke bearing frame, pull faulty yoke cable or lamp wire thru yoke and out yoke bearing frame.



**Figure 3-43. Yoke Cables and Lamp Wire Removal**

Step 18. Install replacement yoke cable or lamp wire.

- At replacement yoke cable or lamp wire, tape one connector to very long cable tie. Tape connector to cable tie so that connector's short side faces forward (Figure 3-44).



**Figure 3-44. Yoke Cables and Lamp Wire Replacement**

- Insert untaped end of cable tie into pan tube from yoke bearing frame side. Push cable tie thru yoke until cable tie is visible thru tilt tube in luminaire head.
- Pull cable tie (with yoke cable) thru tilt tube until connector extends thru tilt tube.

- d. Untape connector from cable tie.
- e. Maneuver yoke cable or lamp wires so that spring on cable extends equally from pan tube and tilt tube.

---

**Note:** Cables should only come out of side rail approximately 1 to 1-1/2".

Step 19. Re-assemble luminaire by doing Steps 2 thru 17 in reverse.

# Chapter 4. Illustrated Parts Breakdown

This chapter contains a complete illustrated parts breakdown for the **VL4** wash luminaire. All parts are identified by their Vari-Lite part number and name for the purpose of identification and ordering. This chapter is divided into the following sections:

- 4.1 Drawing Tree
  - 4.2 Parts Breakdown
- 

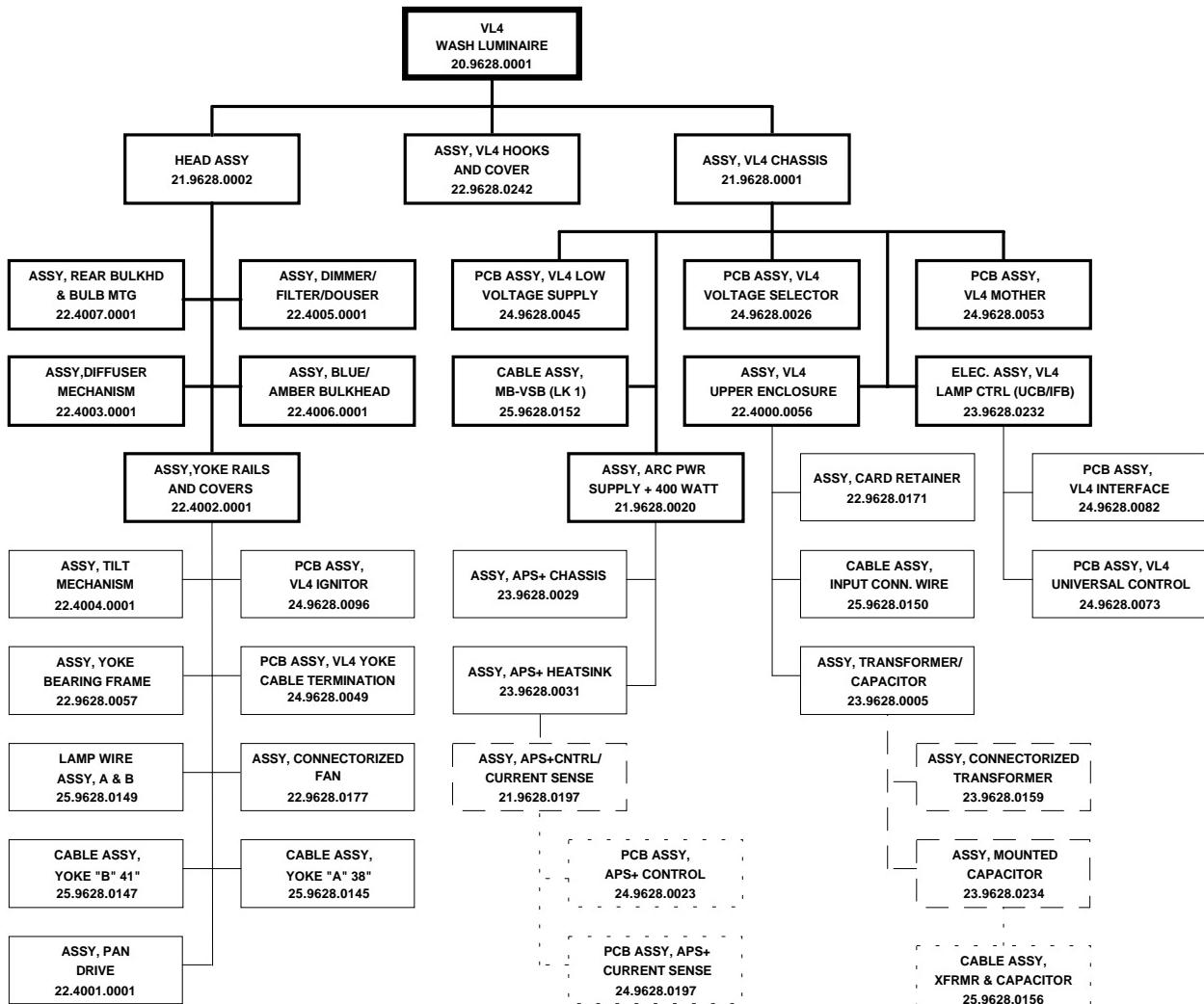
**Note:** All parts for each sub-assembly are listed in part number order. Parts are identified on the corresponding illustration by item numbers. If a part is used multiple times in different places, the quantity is noted next to the illustration item number.

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## 4.1 Drawing Tree

### 4.1.1 VL4 Wash Luminaire 20.9628.0001



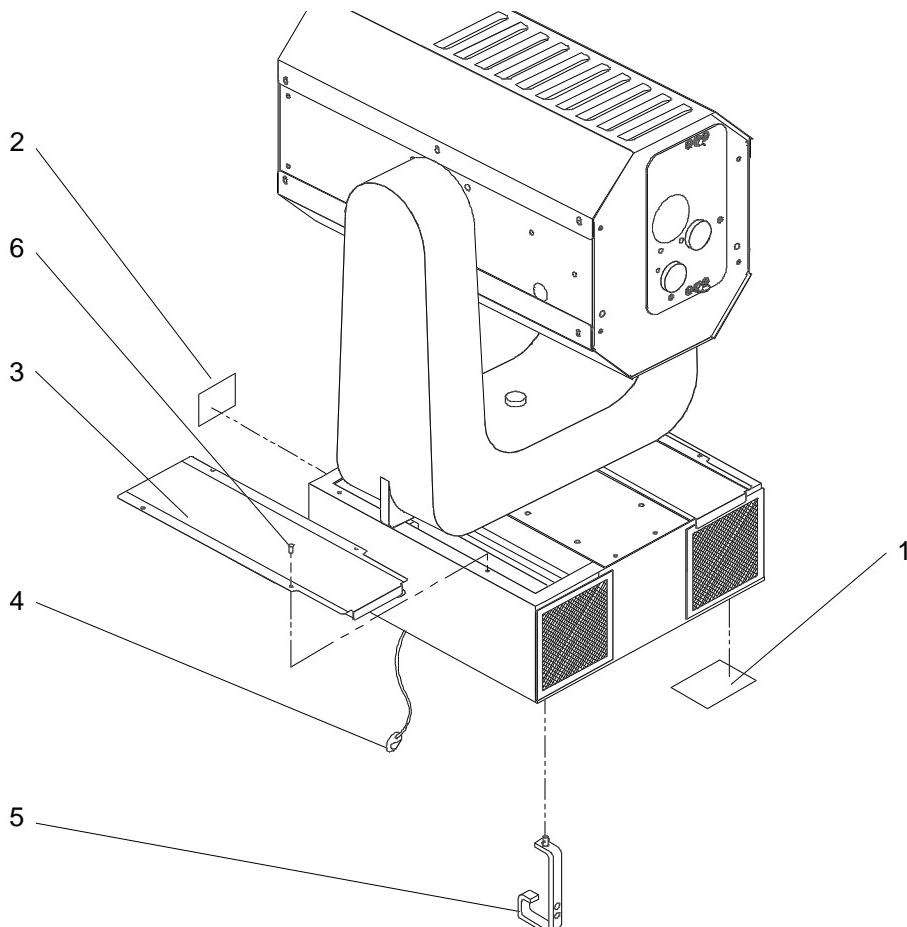
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## 4.2 Parts Breakdown

### 4.2.1 Hooks and Covers

#### 4.2.1.1 Assy, VL4 Hooks and Covers 22.9628.0242

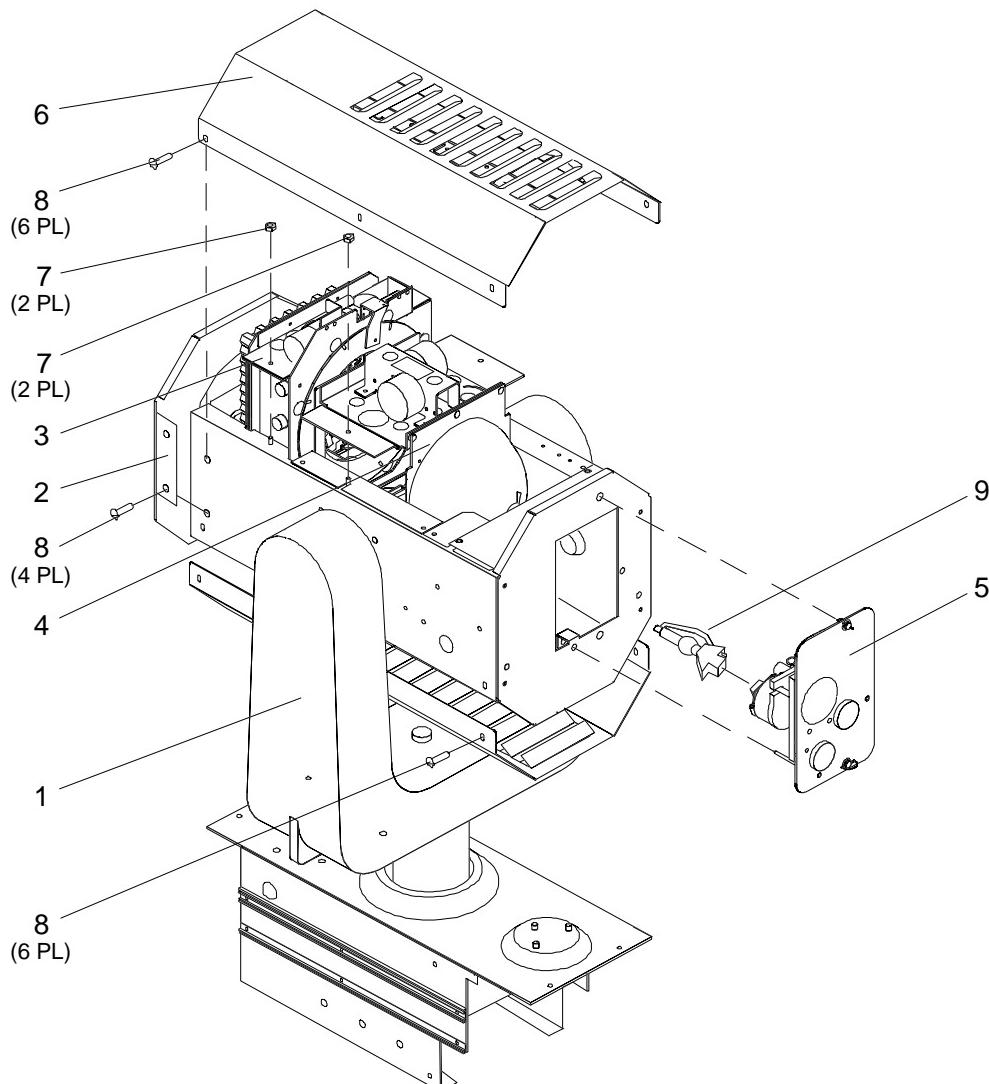
NO.	PART NO.	QTY	DESCRIPTION
1	04.3001.0004	1 EA	LAMP ID TAG, VL4
2	04.9628.0246	1 EA	LABEL, INPUT RATING -VL4
3	10.9628.0128	2 EA	COVER, TOP, CHASSIS
4	22.9620.0194	1 EA	ASSY, LAMP SAFETY CABLE
5	22.9620.0217	2 EA	ASSY, TRUSS HOOK, 200S
	12.9620.0093	1 EA	ASSY, TRUSS HOOK
	52.8207.0001	1 EA	PIN, CROSS FOR #7 Q F
	53.6505.0002	1 EA	BOLT, 3/8-16X1-1/2 BLK WING
	55.6632.0001	1 EA	WASHER, TRUSS HK BRASS .016X.997ODX.364ID
6	52.6524.0002	8 EA	SCREW, 6-32X5/16"PPB



## 4.2.2 Head Assembly

### 4.2.2.1 Assy, VL4 Head 21.9628.0002

NO.	PART NO.	QTY	DESCRIPTION
1	22.4002.0001	1 EA	ASSY, YOKE RAILS AND COVERS (VL4)
2	22.4003.0001	1 EA	ASSY, DIFFUSER MECHANISM (VL4)
3	22.4005.0001	1 EA	ASSY, DIMMER/FILTER/DOUSER (VL4)
4	22.4006.0001	1 EA	ASSY, BLUE/AMBER BULKHEAD (VL4)
5	22.4007.0001	1 EA	ASSY, REAR BULKHD & BULB MTG. (VL4)
6	22.9628.0125	2 EA	ASSY, VL4 HEAD COVERS
7	53.2200.0006	4 EA	NUT, 6-32 KEPS SS
8	53.6524.0002	16 EA	SCREW, 6-32X5/16"PPB
9	71.2524.0002	1 EA	LAMP, HTI 404 WATT W/SE



**4.2.2.2 Assy, Dimmer/Filter/Douser VL4  
22.4005.0001**

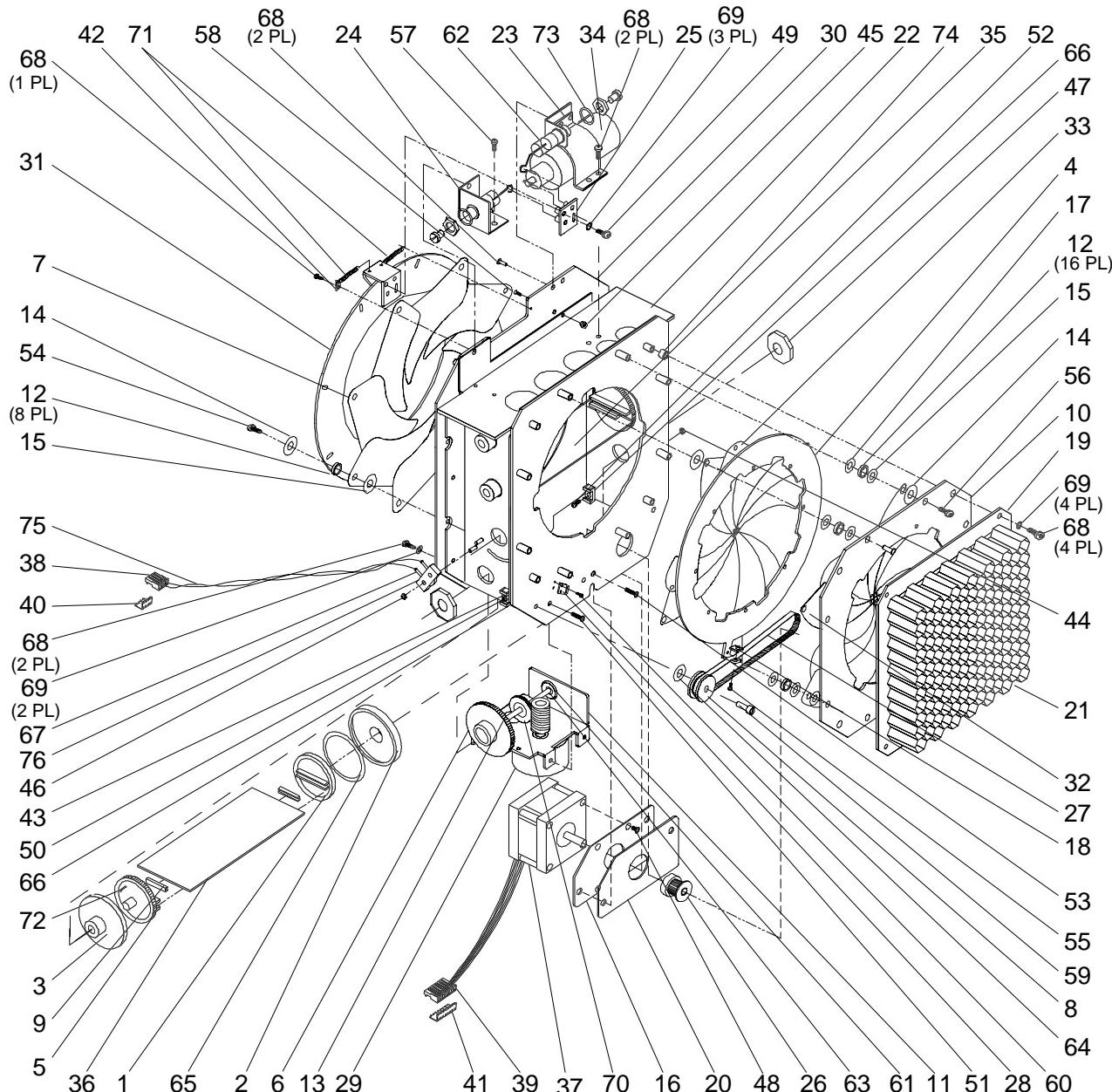
NO.	PART NO.	QTY	DESCRIPTION
1	10.9620.0063	3 EA	CARRIER, FILTER
2	10.9620.0245	3 EA	BUSHING, FILTER, CARRIER
3	10.9620.0246	3 EA	BUSHING, FILTER GEAR
4	10.9628.0010	1 EA	ACTUATOR, DIMMER
5	10.9628.0019	3 EA	GEAR, FILTER
6	10.9628.0021	1 EA	GEAR, SPUR
7	10.9628.0066	8 EA	LEAF, DOUSER
8	10.9628.0075	1 EA	PULLEY, IDLER
9	10.9628.0080	6 EA	PAD, FILTER
10	10.9628.0089	1 EA	PLATE, COVER, DIMMER
11	10.9628.0090	1 EA	MOUNT, MOTOR, MAGENTA
12	10.9628.0101	16 EA	ROLLER, DOUSER/DIMMER
13	10.9628.0102	1 EA	SHAFT, DRIVE, MAGENTA
14	10.9628.0105	15 EA	WASHER, SPECIAL .010THK X .500 DIA
15	10.9628.0106	17 EA	WASHER, SPECIAL, .010THK X .350 DIA
16	10.9628.0108	1 EA	PLATE, MOUNTING, MOTOR, DIMMER
17	10.9628.0109	8 EA	WASHER, SPECIAL, .025THK X .350 DIA
18	10.9628.0113	1 EA	CLAMP, BELT, DIMMER
19	10.9628.0140	1 EA	FRAME, FILTER, ULTRA-VIOLET
20	10.9628.0162	1 EA	PAD, MOTOR, DIMMER
21	10.9628.0167	1 EA	HONEYCOMB, VL4
22	10.9628.0178	1 EA	PLATE, MOUNTING, SOLENOID
23	10.9628.0179	1 EA	CLAMP, SOLENOID
24	10.9628.0180	1 EA	MOUNT, DASHPOT
25	10.9628.0182	1 EA	PLATE, TAB, DOUSER
26	10.9628.0191	1 EA	PULLEY, DRIVE, DIMMER
27	10.9628.0221	1 EA	BELT,DFD,VL4,.0816P,98T,.250W
28	22.1026.0002	1 EA	ASSY, SWITCH, SUB-MICRO W/WIRES (VL4 DIM)
29	22.5016.0001	1 EA	ASSY,15 DEGREE STEPPER MOTOR
30	22.9628.0086	1 EA	ASSY, VL4 DIMMER/FILTER FRAME
31	22.9628.0185	1 EA	ASSY, VL4 DOUSER RING
32	22.9628.0187	4 EA	ASSY, VL4 DIMMER LEAF, LFT-HAND
33	22.9628.0188	4 EA	ASSY, VL4 DIMMER LEAF, RT-HAND
34	22.9628.0231	1 EA	ASSY, VL4 SOLENOID
35	41.9628.0034	1 EA	FILTER, CCF, 4 1/8" X 2" (VL4)
36	41.9628.0035	2 EA	FILTER, CCF, 4 1/8" X 1 11/16" (VL4)

**Assy, Dimmer/Filter/Douser VL4 (continued)**  
**22.4005.0001**

NO.	PART NO.	QTY	DESCRIPTION
37	44.6000.0001	1 EA	MOTOR, STEPPER .9DEG 48 OHM
38	52.6300.0001	1 EA	CONN HOUSING, MTA CLOSE END NATRL 4 PIN
39	52.6383.0001	1 EA	CONN, HOUSING, MTA CLOSED END BLU 8 PIN
40	52.6424.0004	1 EA	COVER, STRAIN RELIEF/4POS MTA
41	52.6424.0008	1 EA	COVER, STRAIN RELIEF/8POS MTA
42	52.8400.0001	1 EA	LUG, SOLDER, ANGLE .120 HOLE SZE
43	53.2002.0001	1 EA	NUT, 6-32 KEP ZINC PLATED
44	53.2003.0001	1 EA	NUT, 4-40 KEP ZINC PLATED
45	53.2009.0001	1 EA	NUT, #2-56
46	53.2009.0003	2 EA	NUT, 2-56 NYLON INSERT STOP LOCKING
47	53.2301.0001	6 EA	PALNUT, 1/2 -13 UNC THRD. X 3/4 OD
48	53.6513.0002	4 EA	SCREW, 3MM X 5MM PFZ
49	53.6520.0001	3 EA	SCREW, 4-40 X 3/8" PPZ
50	53.6525.0001	1 EA	SCREW, 6-32 X 5/16"PPZ
51	53.6559.0001	2 EA	SCREW, 4-40 X 1/4" PFZ
52	53.6596.0001	1 EA	SCREW, 4-40 X 5/16" PPZ
53	53.6599.0001	2 EA	SCREW, 4-40 X 3/8" PFZ
54	53.6601.0002	8 EA	SCREW, 4-40 X 3/16"PTH Z
55	53.6659.0002	1 EA	SCREW, 2-56 X 1/4" PPZ
56	53.6659.0004	2 EA	SCREW, 2-56 X 1/4" PPZ
57	53.6659.006	2 EA	SCREW, 2-56 X 3/16" PPZ
58	53.6659.0008	1 EA	SCREW, 2-56 X 3/16" PFZ
59	53.6660.0001	1 EA	SCREW, 8-32 X 5/16" SLOT HEAD SHOULDER
60	53.6661.0002	2 EA	SCREW, 0-80 X 5/16" PPZ
61	54.1208.0001	2 EA	BEARING, 1/4"
62	54.2006.0002	2 EA	DASHPOT, 1/2" ID X 3/4" L w/1-1/8" ROD
63	54.2007.0001	1 EA	RETAINING RING, EXTERNAL 1/4" SHAFT DIA.
64	55.2111.0001	1 EA	WASHER, S/S FLAT, .437OD X .159ID X .028THK
65	55.2123.0002	3 EA	WAVE SPRING
66	55.2179.0002	2 EA	SADDLE, TYWRAP (VL-1)
67	55.2198.0001	1 IN	HEAT SHRINK 1/8" BLK
68	55.2203.0001	11 EA	SCREW, 4-40 X 1/4" PPZ
69	55.6537.0001	9 EA	WASHER, LOCK #4 INTERNAL TOOTH
70	55.6570.0002	1 EA	WRM WHL, MLDED 48P 40T 3/16F 1/4" BORE Delrin
71	55.6603.0001	2 EA	SPRING, SS 4.6#/IN. EXTENSION

**Assy, Dimmer/Filter/Douser VL4 (continued)**  
**22.4005.0001**

NO.	PART NO.	QTY	DESCRIPTION
72	55.6612.0003	1 EA	PIN, 3/64" X 1/2" SPIRAL STAINLESS STEEL
73	55.6618.0001	1 EA	WASHER, LOCK INT TTH 1/2"OD X 3/8" ID
74	55.9628.0192	4 EA	SPACER, DMR COVER, .250 OD X .175 ID , .146T
75	73.7021.0006	2 EA	WIRE, 24AWG BLUE TWISTED PR.
76	74.1023.0001	1 EA	SWITCH, GOLD CROSSPOINT CONTACT

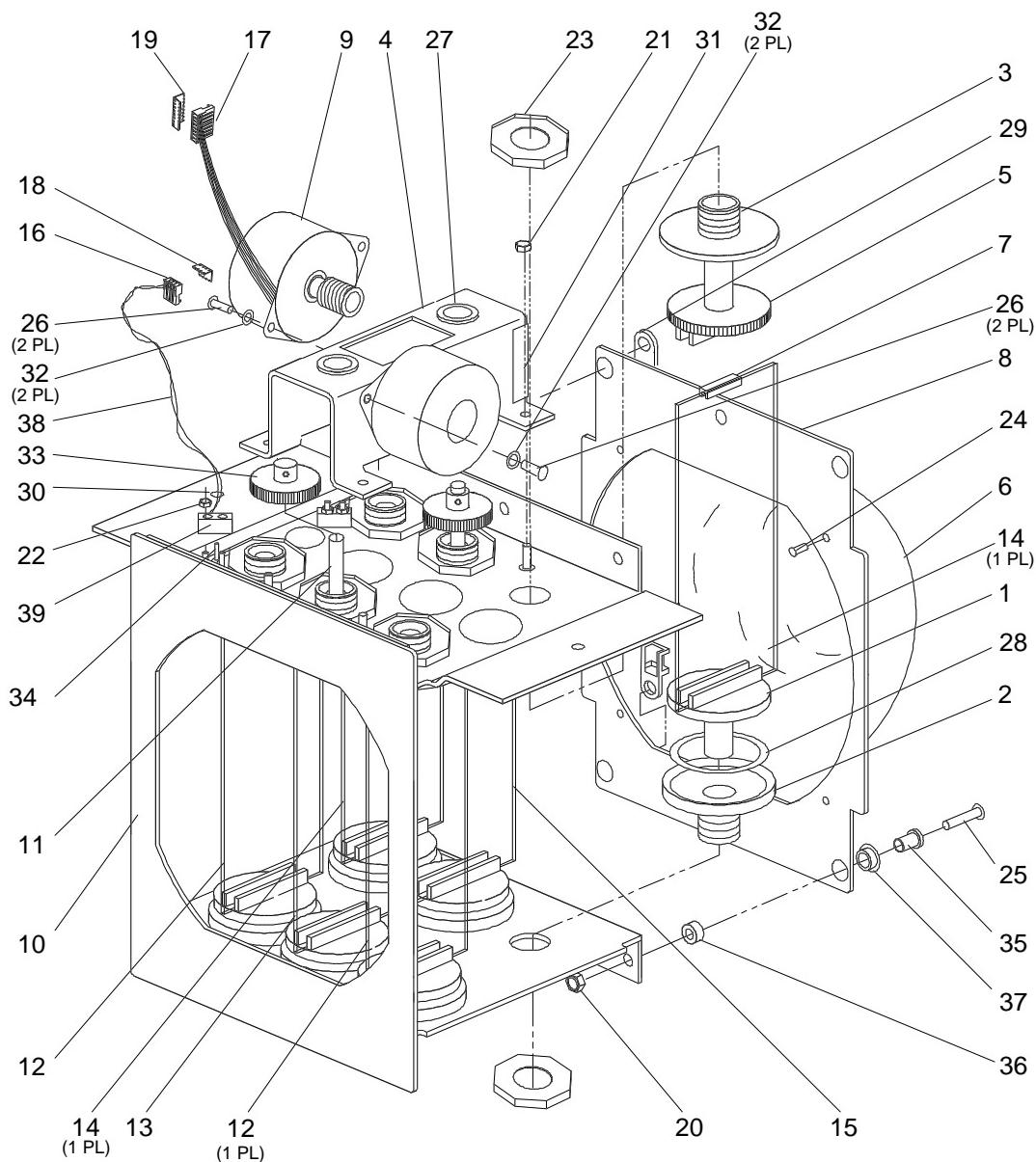


**4.2.2.3 Assy, Blue/Amber Bulkhead (VL4)**  
**22.4006.0001**

NO.	PART NO.	QTY	DESCRIPTION
1	10.9620.0063	6 EA	CARRIER, FILTER
2	10.9620.0245	6 EA	BUSHING, FILTER CARRIER
3	10.9620.0246	6 EA	BUSHING, FILTER GEAR
4	10.9628.0018	1 EA	MOUNT, MOTOR
5	10.9628.0019	6 EA	GEAR, FILTER
6	10.9628.0069	1 EA	REFLECTOR, VL4
7	10.9628.0080	12 EA	PAD, FILTER
8	10.9628.0085	1 EA	MOUNT, REFLECTOR
9	22.5016.0001	2 EA	ASSY, 15 DEGREE STEPPER MOTOR
	10.9620.0161	1 EA	WORM, STAINLESS STEEL, 1/8" BORE
	44.5016.0001	1 EA	MOTOR, STPR 15DEG CAN-STACK 25OH COIL
	55.6677.0002	1 EA	WASHER, .360OD X .123ID X .025THK, NYLON
10	22.9628.0011	1 EA	ASSY, VL4 COLOR CHANGER BULKHEAD
11	22.9628.0247	2 EA	ASSY, FILTER GEAR DRIVE - VL4
	10.9628.0019	1 EA	GEAR, FILTER
	10.9628.0107	1 EA	SHAFT, EXTENSION, FILTER GEAR
12	41.9628.0136	2 EA	FILTER, LWP, 4 1/8" X 1 11/16" (VL4)
13	41.9628.0137	1 EA	FILTER, LWP, 4 1/8" X 2"
14	41.9628.0138	2 EA	FILTER, SWP, 4 1/8" X 1 11/16" (VL4)
15	41.9628.0139	1 EA	FILTER, SWP, 4 1/8" X 2" (VL4)
16	52.6300.0001	2 EA	CONN HOUSNG, MTA CLOSED END NATRL 4PIN
17	52.6383.0001	2 EA	CONN HOUSING MTA CLOSED END BLU 8PIN
18	52.6424.0004	2 EA	COVER, STRAIN RELIEF/4POS MTA
19	52.6424.0008	2 EA	COVER, STRAIN RELIEF/8POS MTA
20	53.2002.0001	4 EA	NUT, 6-32 KEP ZINC PLATED
21	53.2003.0001	4 EA	NUT, 4-40, KEP ZINC PLATED
22	53.2009.0003	4 EA	NUT, 2-56 NYLON INSERT STOP LOCKING
23	53.2301.0001	12 EA	PALNUT, 1/2-13 UNC THRD. X 3/4 OD
24	53.6534.0001	4 EA	RIVET, POP, ALUM 3/32OD,3/32GRIP RANGE
25	53.6557.0001	4 EA	SCREW, 6-32 X 9/16"PPZ
26	53.6597.0001	4 EA	SCREW, 4-40 X 3/16" PPZ
27	54.1208.0001	2 EA	BEARING, 1/4"
28	55.2123.0002	6 EA	WAVE SPRING
29	55.2179.0002	2 EA	SADDLE, TYWRAP (VL-1)
30	55.2198.0001	2 IN	HEAT SHRINK 1/8" BLK
31	55.6510.0001	1 IN	GROMMET, 032-.052THK .052ID

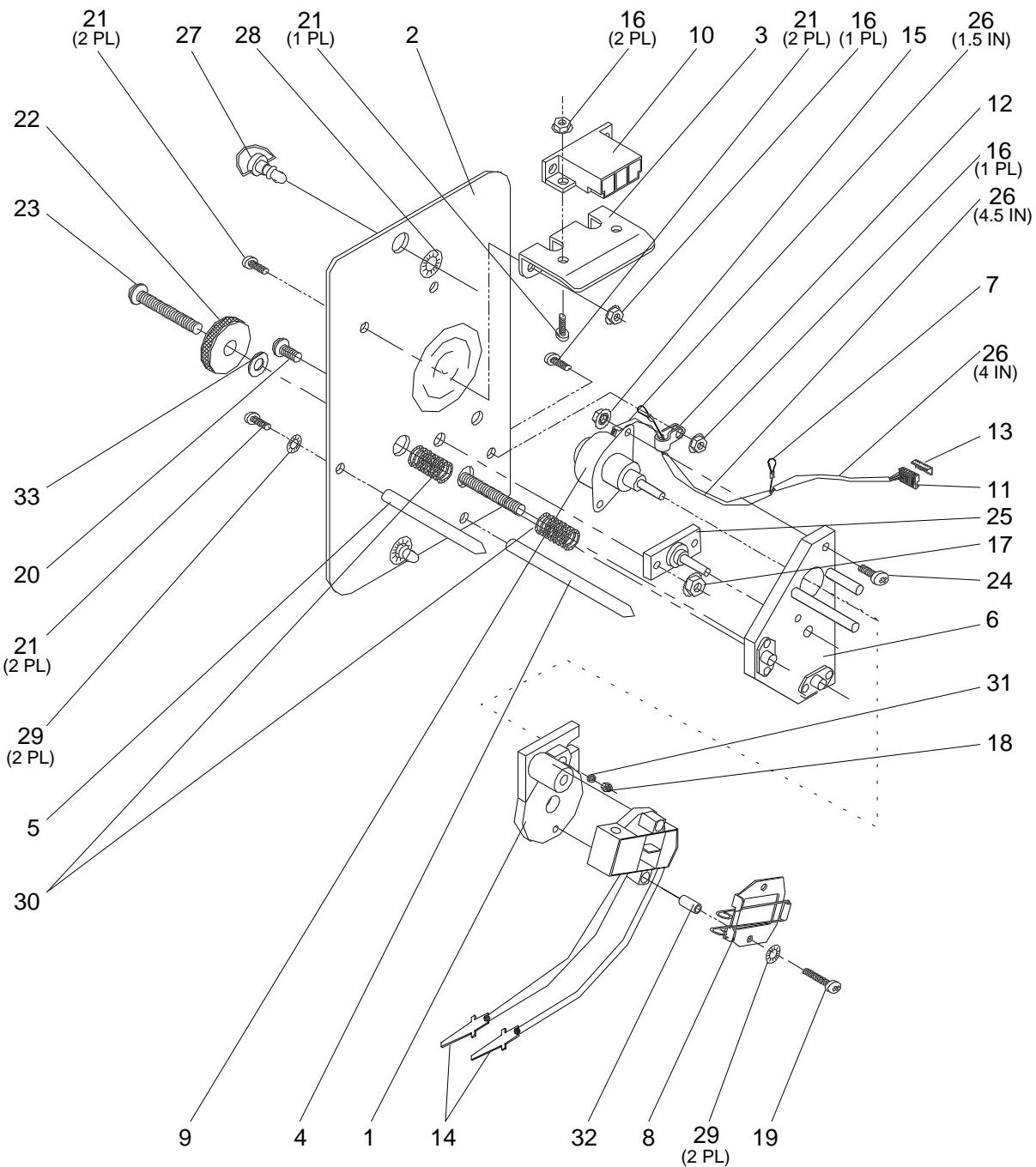
**Assy, Blue/Amber Bulkhead (VL4) (continued)**  
**22.4006.0001**

NO.	PART NO.	QTY	DESCRIPTION
32	55.6537.0001	4 EA	WASHER, LOCK #4 INTERNAL TOOTH
33	55.6570.0001	2 EA	WORM WHEEL, ULTEM 100Q
34	55.6612.0003	2 EA	PIN, 3/64" X 1/2" SPRIAL STAINLESS STEEL
35	55.6689.0001	4 EA	INSULATOR, MOLDED NYL SCREW #6 x 1/4"L
36	55.6689.0003	4 EA	WASHER, MOLDED NYL, #8 X 1/8"T X 3/8"D
37	55.6689.0004	4 EA	WASHER, MOLDED NYL SHOULDER, #8
38	73.7021.0006	44 IN	WIRE, 24AWG BLUE TWISTED PR.
39	74.1023.0001	2 EA	SWITCH, GOLD CROSSPOINT CONTACT



**4.2.2.4 Assy, Rear Bulkhead & Bulb MTG. (VL4)**  
**22.4007.0001**

NO.	PART NO.	QTY	DESCRIPTION
1	10.9620.0240	1 EA	CARRIAGE, UNIVERSAL, LAMP
2	10.9628.0043	1 EA	PLATE, ACCESS, LAMP
3	10.9628.0111	1 EA	BRACKET, CONNECTOR, LAMP WIRE
4	10.9628.0193	1 EA	PIN, GUIDE, LONG, LAMP ACCESS PLATE
5	10.9628.0194	1 EA	PIN, GUIDE, SHORT, LAMP ACCESS PLATE
6	22.9628.0100	1 EA	ASSY, VL4 LINEAR ACTUATOR MTNG PLATE
7	22.9628.0163	1 EA	ASSY, VL4 SAFETY TETHER LMP ACCES PLTE
8	22.9628.0172	1 EA	ASSY, VL4 LAMP RETAINER
9	44.5013.0001	1 EA	MOTOR, LINEAR ACTUATOR 12V
10	52.6264.0003	1 EA	CONN HOUSING, 30 SERIES W/FLNGS 3POS
11	52.6383.0001	1 EA	CONN HOUSING, MTA CLOSED END BLU 8PIN
12	52.6421.0001	1 EA	CLAMP, CABLE NYLON 1/8"
13	52.6424.0008	1 EA	COVER, STRAIN RELIEF/8POS MTA
14	52.8247.0002	2 EA	CRIMP CONTACT, S30 TIN (LOOSE)
15	53.2002.0001	2 EA	NUT, 6-32 KEP ZINC PLATED
16	53.2003.0001	5 EA	NUT, 4-40, KEP ZINC PLATED
17	53.2004.0001	2 EA	NUT, 8-32, KEP
18	53.2009.0001	1 EA	NUT, #2-56
19	53.6404.0003	2 EA	SCREW, 4-40X1" PPZ
20	53.6545.0001	2 EA	SCREW, 8-32X3/8"PPB
21	53.6551.0001	7 EA	SCREW, 4-40X3/8"PPB
22	53.6565.0003	2 EA	KNOB, KNURLED 10-32
23	53.6594.0001	2 EA	SCREW, 10-32X1 1/2"PPB
24	53.6613.0001	2 EA	SCREW, 6-32X1/2"PPZ
25	54.1209.0002	1 EA	SWIVEL BEARING ASSY.,.385 STUD LNGTH
	55.2186.0001	2 EA	CABLE TIE, SMALL .10X4" (Not Shown)
26	55.2200.0002	10 IN	SLEEVING,SIL RUB COATED FBRGLAS .162ID
27	55.2233.0002	2 EA	STUD, 1/4 TURN BAILHEAD (VL4)
28	55.2233.0003	2 EA	RETAINER, PUSH-ON TYPE (VL4)
29	55.6537.0001	4 EA	WASHER, LOCK #4 INTERNAL TOOTH
30	55.6568.0009	2 EA	SPRING, 1-1/4" COMPRESSION
31	55.6569.0001	1 EA	WASHER, LOCK #2
32	55.6595.0002	2 EA	SPACER, 1/4" RND 4 THRU 1/2" ALUM
33	55.6609.0001	2 EA	WASHER, FLT NYL 3/8"IDX .890OD
34	71.2521.0001	1 EA	SOCKET, S.E. ARC LAMP

**Assy, Rear Bulkhead & Bulb (continued)**  
**22.4007.0001**

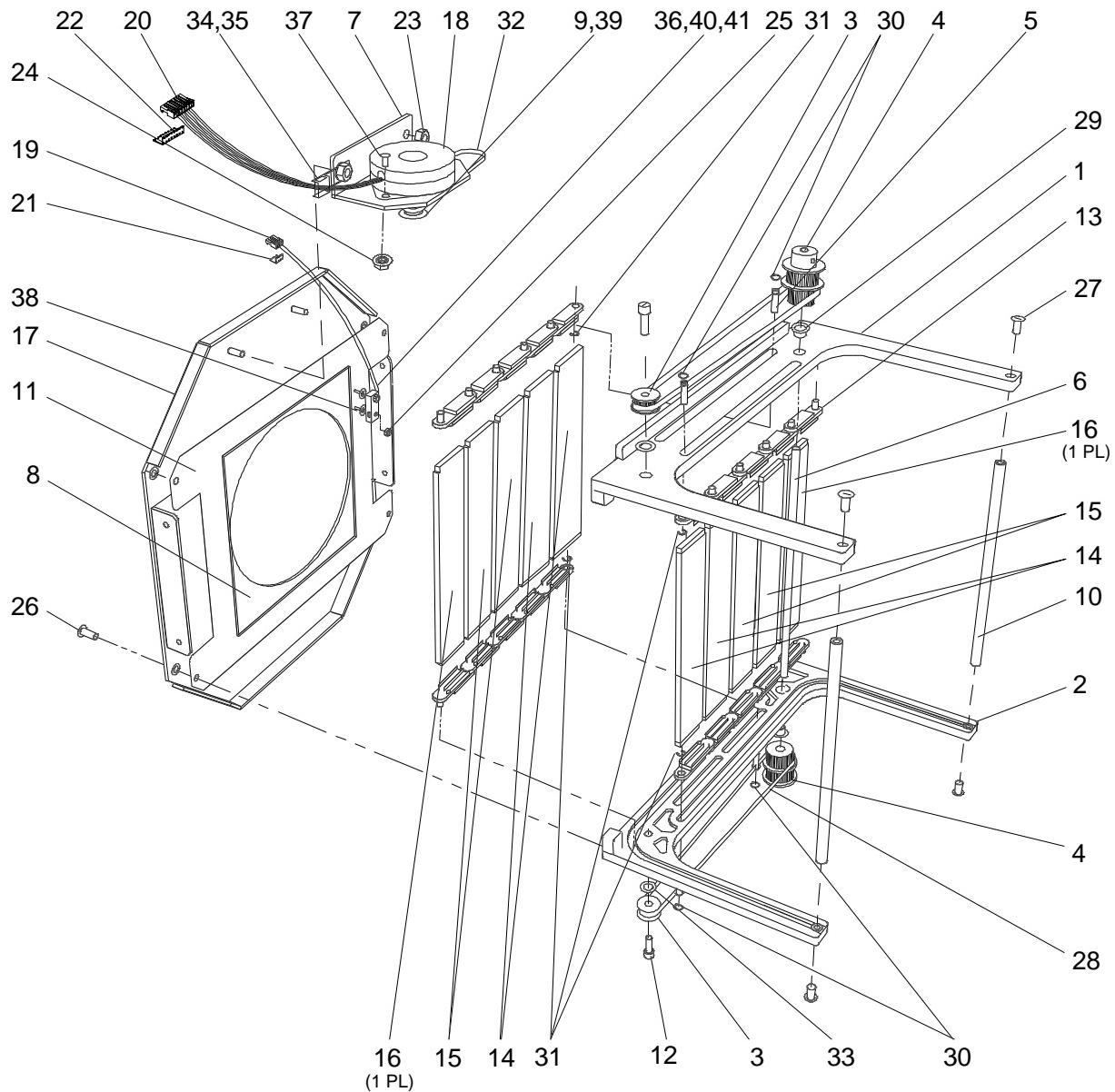
#### 4.2.2.5 Assy, Diffuser Mechanism (VL4)

#### 22.4003.0001

NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0063	1 EA	TRACK, DIFFUSER, TOP
2	10.9628.0064	1 EA	TRACK, DIFFUSER, BOTTOM
3	10.9628.0075	2 EA	PULLEY, IDLER
4	10.9628.0076	2 EA	PULLEY, REDUCTION
5	10.9628.0099	4 EA	PIN, ACTUATOR, DIFFUSER
6	10.9628.0104	1 EA	SHAFT, DRIVE, DIFFUSER
7	10.9628.0110	1 EA	MOUNT, MOTOR, DIFFUSER
8	10.9628.0141	1 EA	FILTER, ULTRA-VIOLET, 4.062" SQUARE
9	10.9628.0189	1 EA	PULLEY, DRIVE, DIFFUSER
10	10.9628.0208	2 EA	STANDOFF, SPECIAL, RND, 2-56X3/16X4 9/16
11	10.9628.0224	1 EA	PLATE, SPACER, UV GLASS/DIFFUSER
12	10.9628.0228	2 EA	SCREW, SHOULDER, ECCENTRIC
13	10.9628.0230	20 EA	CARRIER, DIFFUSER, (VALOX)
14	12.4003.0001	4 EA	GLASS PANEL, MACHINED, GLARE RES.CLEAR
15	12.4003.0002	4 EA	GLASS PANEL, MACHINED, PATTERN #62
16	12.4003.0003	2 EA	GLASS PANEL, MACHINED, MOSS PATTERN
17	22.9628.0092	1 EA	ASSY, VL4 DIFFUSER FRNT APERTURE PLATE
18	44.5001.0000	1 EA	MOTOR, STEPPER 7.5DEG 25 OHM COIL
19	52.6300.0001	1 EA	CONN HOUSING, MTA CLOSED END Natrl 4PIN
20	52.6383.0001	1 EA	CONN HOUSING, MTA CLOSED END BLU 8PIN
21	52.6424.0004	1 EA	COVER, STRAIN RELIEF/4POS MTA
22	52.6424.0008	1 EA	COVER, STRAIN RELIEF/8POS MTA
23	53.2002.0001	2 EA	NUT, 6-32, KEP ZINC PLATED
24	53.2003.0001	2 EA	NUT, 4-40, KEP ZINC PLATED
25	53.2009.0003	2 EA	NUT, 2-56 NYLON INSERT STOP LOCKING
26	53.6559.0002	4 EA	SCREW, 4-40 X 1/4"PFB
27	53.6659.0005	4 EA	SCREW, 2-56x1/4"PFZ
28	54.2001.0004	2 EA	BELT, DIFF(LONG),VL4,.0816P,150T,.187W
29	54.2002.0002	2 EA	BEARING, 1/8"BORE S/S ROLLER
30	54.2002.0003	4 EA	RING, RETAINING EXTERNAL 3/16"ID
31	54.2002.0004	4 EA	RING, RETAINING E-RING 1/8"ID
32	54.2002.0005	1 EA	BELT, DIFF(SHORT),VL4,.0816P,81T,.187W
33	55.2111.0001	2 EA	WASHER, S/S FLAT,.437OD X .159ID X.028THK
34	55.2178.0001	1 EA	CABLE ANCHOR MOUNT, #8 SCREW MOUNTING
35	55.2186.0001	1 EA	CABLE TIE, SMALL .10X4"
36	55.2198.0001	1 IN	HEATSHRINK 1/8" BLK
37	55.2203.0001	2 EA	SCREW, 4-40X1/4" PPZ

## **Assy, Diffuser Mechanism (VL4) (continued)**

<b>NO.</b>	<b>PART NO.</b>	<b>QTY</b>	<b>DESCRIPTION</b>
38	55.6621.0001	2 EA	WASHER, FLAT #4 ID .120 .028THK
39	55.6677.0002	3 EA	WASHER, .360OD X .123ID X .025THK, NYLON
40	73.7021.0006	23 IN	WIRE, 24AWG BLUE TWISTED PR.
41	74.1023.0001	1 EA	SWITCH, GOLD CROSSPOINT CONTACT



#### 4.2.2.6 Assy, Yoke Rails & Covers (VL4)

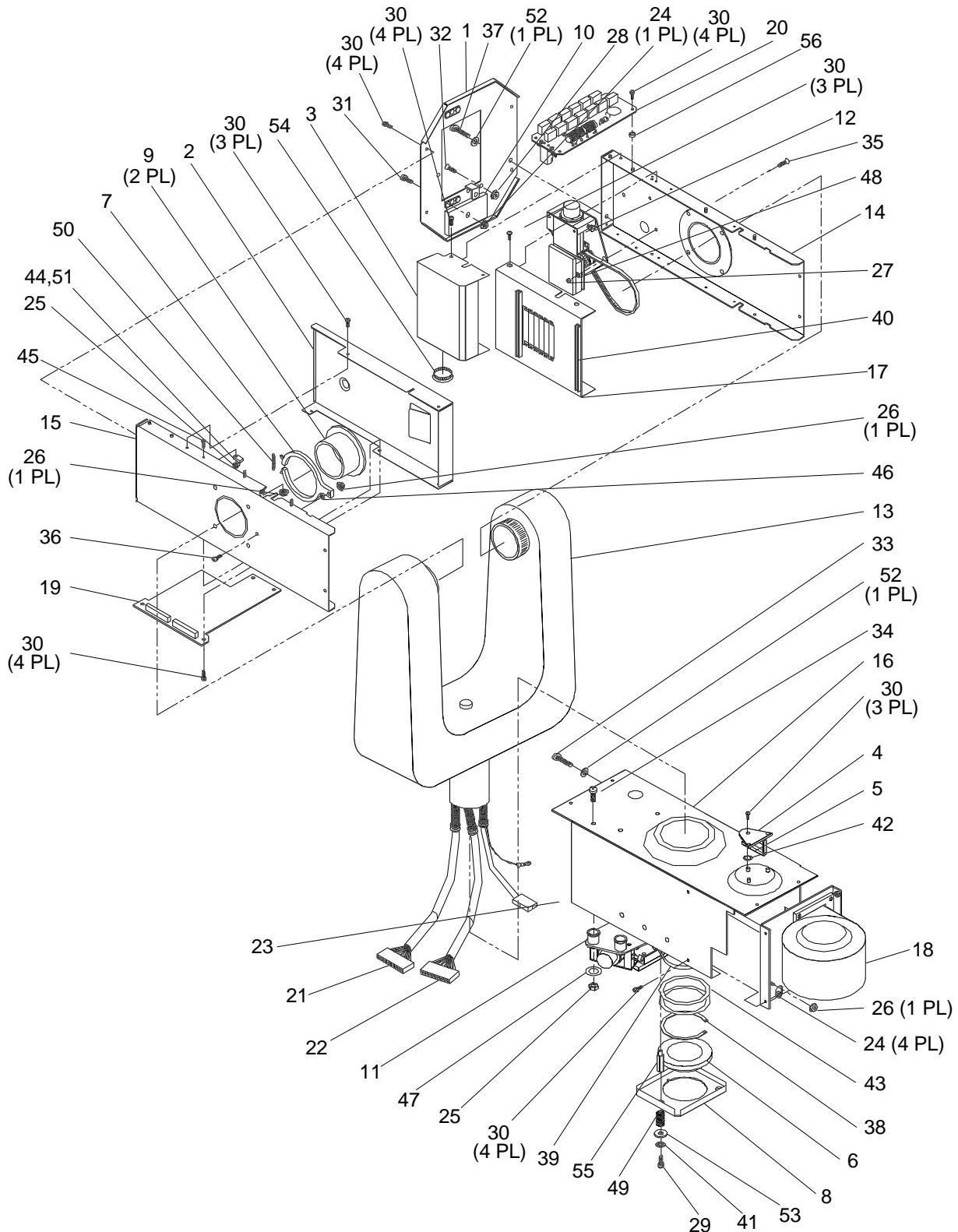
#### 22.4002.0001

NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0042	1 EA	COVER, REAR
2	10.9628.0119	1 EA	COVER, SIDE, CABLE
3	10.9628.0120	1 EA	COVER, TILT MECHANISM
4	10.9628.0123	1 EA	PLATE, STOP, PAN
5	10.9628.0124	1 EA	STOP, VL4 PAN
6	10.9628.0210	1 EA	STABILIZER, PAN
7	10.9628.0211	1 EA	STABILIZER, PAN/TILT
8	10.9628.0212	1 EA	BRACKET, STABILIZER, PAN
9	10.9628.0213	2 EA	FLANGE, PULLEY, TILT
10	10.9628.0236	1 EA	COUNTERWEIGHT, VL4
11	22.4001.0001	1 EA	ASSY, PAN DRIVE (VL4)
12	22.4004.0001	1 EA	ASSY, TILT MECHANISM (VL4)
13	22.9628.0033	1 EA	ASSY, VL4 YOKE
14	22.9628.0039	1 EA	ASSY, VL4 PULLEY SIDE RAIL
	10.9628.0039	1 EA	RAIL, SIDE, PULLEY
	53.6506.0001	1 EA	BEARING, TORQUE TUBE, 2.6250OD X 2.0620ID
	54.1206.0001	1 EA	RING, RETAINING 2.521" ID
15	22.9628.0040	1 EA	ASSY, VL4 CABLE SIDE RAIL
	10.9628.0040	1 EA	RAIL, SIDE, CABLE
	53.6506.0001	1 EA	BEARING, TORQUE TUBE, 2.6250OD X 2.0620ID
	54.1206.0001	1 EA	RING, RETAINING 2.521" ID
16	22.9628.0057	1 EA	ASSY, VL4 YOKE BEARING FRAME
17	22.9628.0118	1 EA	COVER, VL4 PULLEY SIDE
18	22.9628.0177	1 EA	ASSY, CONNECTORIZED FAN
19	24.9628.0049	1 EA	PCB ASSY, VL4 YOKE CABLE TERM (YTB)
20	24.9628.0096	1 EA	PCB ASSY, VL4 IGNITOR (IGN4)
21	25.9628.0145	1 EA	CABLE ASSY, YOKE "A" 38" (VL4)
22	25.9628.0147	1 EA	CABLE ASSY, YOKE "B" 41" (VL4)
23	25.9628.0149	1 EA	LAMP WIRE ASSY, A & B (VL4)
24	53.2001.0001	5 EA	NUT, 10-32, KEP ZINC PLATED
25	53.2001.0003	3 EA	NUT, 10-32 NYLON INSERT
26	53.2002.0001	3 EA	NUT, 6-32 KEP ZINC PLATED
27	53.2002.0003	3 EA	NUT, 6-32 HEX Z NY INSERT
28	53.2003.0001	2 EA	NUT, 4-40, KEP ZINC PLATED
29	53.6517.0001	3 EA	SCREW, 10-32 X 3/8"PPZ
30	53.6524.0002	29 EA	SCREW, 6-32X5/16"PPB
31	53.6538.0001	1 EA	SCREW, 10-32X7/8"PPB
32	53.6559.0001	2 EA	SCREW, 4-40X1/4"PFZ
33	53.6593.0001	1 EA	SCREW, 10-32X1"PPB

**Assy, Yoke Rails & Covers (VL4) (continued)**  
**22.4002.0001**

NO.	PART NO.	QTY	DESCRIPTION
34	53.6594.0001	3 EA	SCREW, 10-32X1-1/2"PPB
35	53.6608.0001	3 EA	SCREW, 6-32X3/8"PFB
36	53.6612.0001	1 EA	SCREW, 6-32X1/2"PPB
37	53.6621.0001	1 EA	SCREW, 8-32X1"PPB
38	54.1205.0001	1 EA	RING, RETAINING 1.963" ID
39	54.2001.0003	1 EA	BELT, PAN, VL4 1/5P, 65T, .375W KEVLAR
40	55.2102.0001	4 EA	CARD GUIDE, NYLON 4"
41	55.2114.0001	3 EA	WSHER, LCK INT TTH #10
42	55.2124.0001	1 EA	SPRING, CURVE (HIGH CARBON)
43	55.2129.0002	2 EA	SHIM, STAINLESS STEEL, PAN TUBE
44	55.2178.0001	1 EA	CABLE ANCHOR MOUNT, #8 SCREW MOUNTING
45	55.2201.0001	1 EA	SCREW, 4-40 X 5/16" PFB
46	55.6517.0001	1 EA	WASHER, FLAT STEEL .375ODx.150IDx.031THK
47	55.6522.0001	3 EA	WASHER, FLAT, .750 OD, .192 ID
48	55.6528.0001	3 EA	WASHER, FLAT #6 ZINC
49	55.6568.0015	3 EA	SPRING, COMP.,1.25FL X .455 OD S/S
50	55.6568.0016	1 EA	SPRING, EXTENSION, 1/2"FL X 1/8"OD
51	55.6580.0002	1 EA	TIE, CABLE .18X8"
52	55.6599.0001	2 EA	WASHER, FLAT BLACK #10
53	55.6623.0001	3 EA	WASHER, FLAT #10
54	55.6662.0001	1 EA	HOLE PLUG 3/4"BRASS W/BLK OXIDE
55	55.6669.0006	3 EA	STANDOFF, 5/16"HEX 10-32x1"MF STEEL
56	55.6677.0004	4 EA	WASHER, NYLON, .375"ODx.125"IDx.062"Thk

**Assy, Yoke Rails & Covers (VL4) (continued)**  
**22.4002.0001**

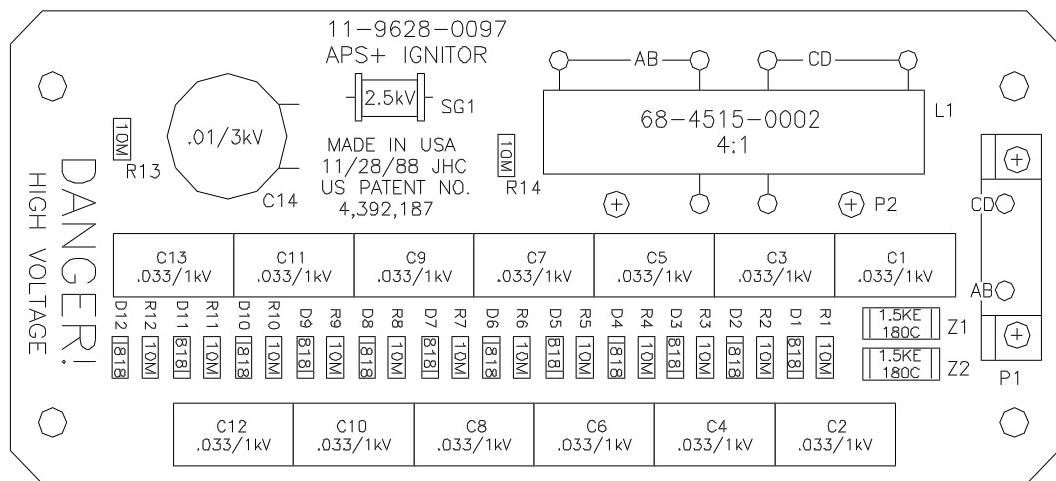
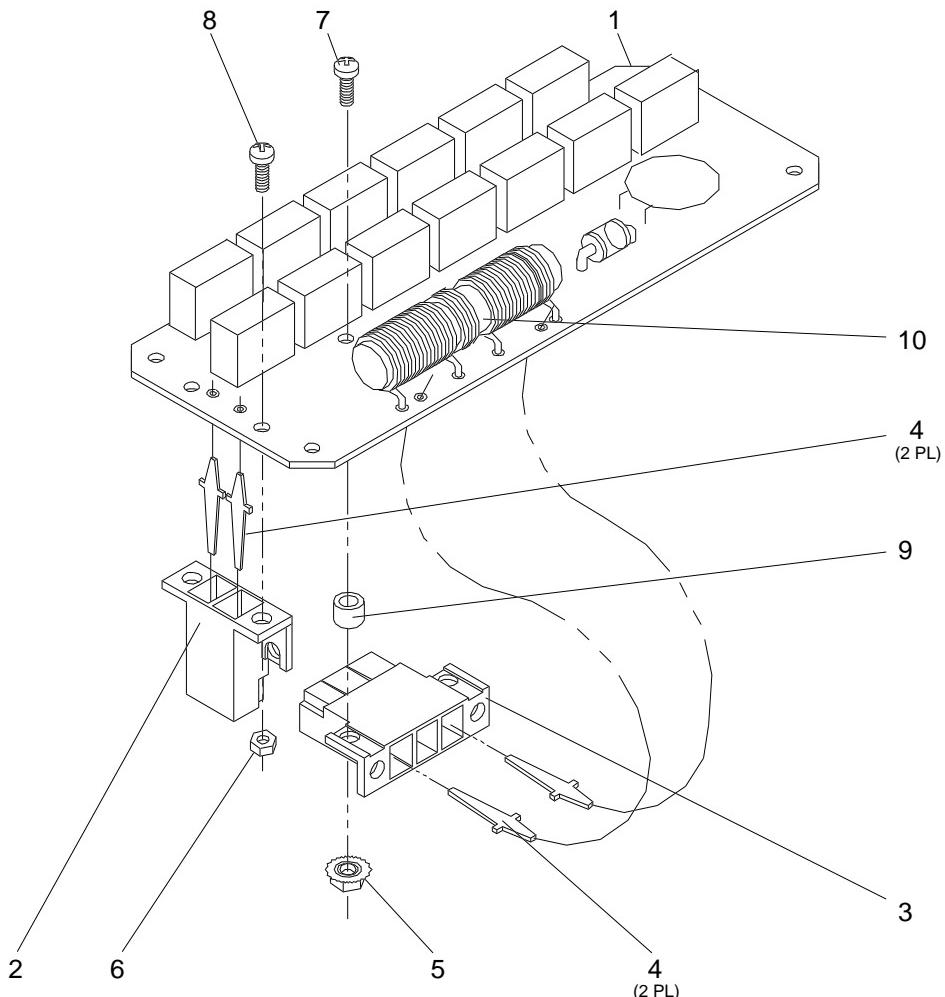


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**4.2.2.7 PCB Assy, VL4 Ignitor (IGN4)**  
**24.9628.0096**

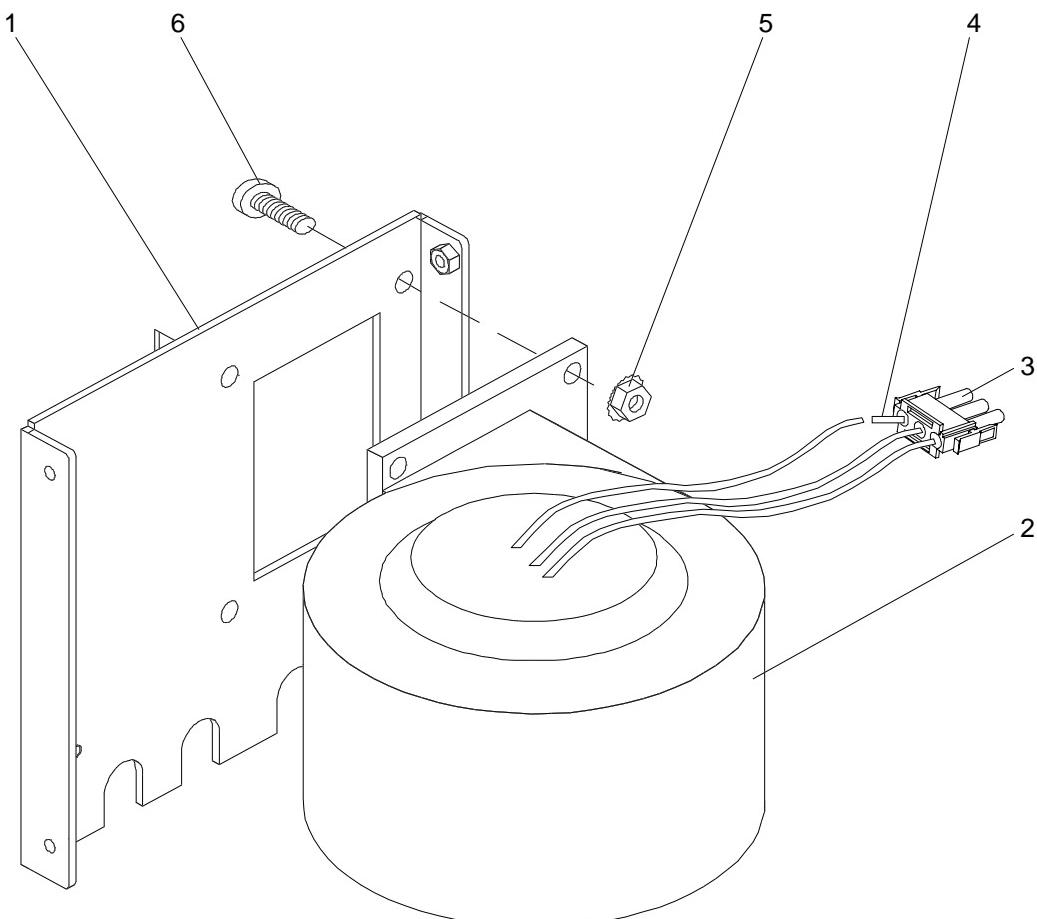
NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	11.9628.0097	1 EA		PCB, VL4 IGNITOR
2	52.6264.0001	1 EA		CONN HOUSING, 30 SERIES W/FLNGS 2POS
3	52.6264.0003	1 EA		CONN HOUSING, 30 SERIES W/FLNGS 3POS
4	52.8209.0001	4 EA		CONTACT, 30 SERIES CONNECTOR POSTED
5	53.2003.0001	2 EA		NUT, 4-40, KEP ZINC PLATED
6	53.2016.0002	2 EA		NUT, 4-40 HEX ZINC
7	53.6567.0001	2 EA		NUT, 4-40 X 1/2" PPZ
8	55.2203.0001	2 EA		SCREW, 4-40X1/4"PPZ
9	55.7003.0001	2 EA		SPACER, 5/16"RND X 3/16"L, NYLON
10	68.4515.0003	1 EA		INDUCTOR, HIGH VOLT, IGNITOR
	60.1422.1002	14 EA	R1-R14	RES, 1/4W 5% 10MEG CF
	62.2032.0001	1 EA	C14	CAP, .01UF, 3000V, RAD, CERAMIC, .375", 20%
	62.3000.0033	13 EA	C1-C13	CAP, .033UF, 1000V, RAD, POLYPRO, .6000", 10%
	75.7102.0001	1 EA	SG1	SPARK GAP, 2.5KV
	82.4311.0818	12 EA	D1-D12	DIODE, RECTIFIER, MR818 1KV 1A
	82.5310.6304	2 EA	Z1, Z2	DIODE, Z CLIPPER, 1.5E180CA 180V 5W

**PCB Assy, VL4 Ignitor (IGN4) (continued)**  
**24.9628.0096**



#### 4.2.2.8 Assy, Connectorized Fan 22.9628.0177

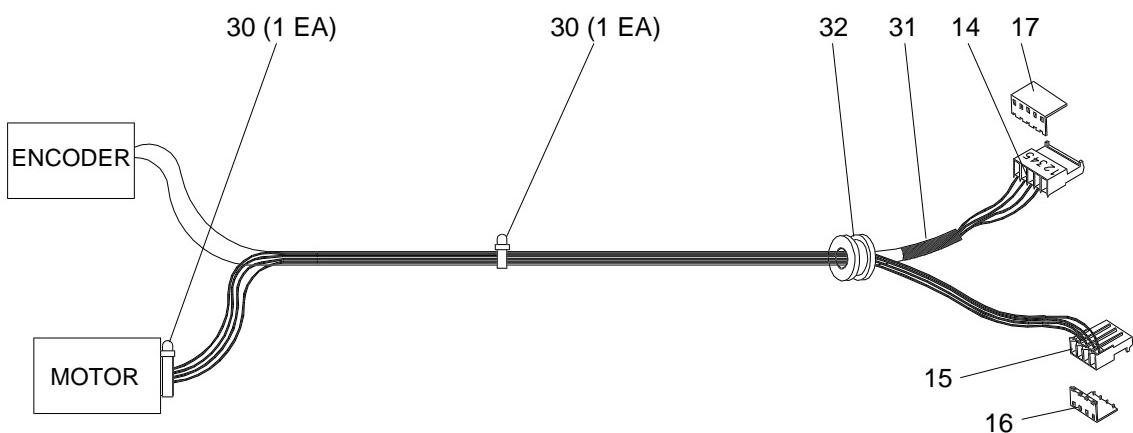
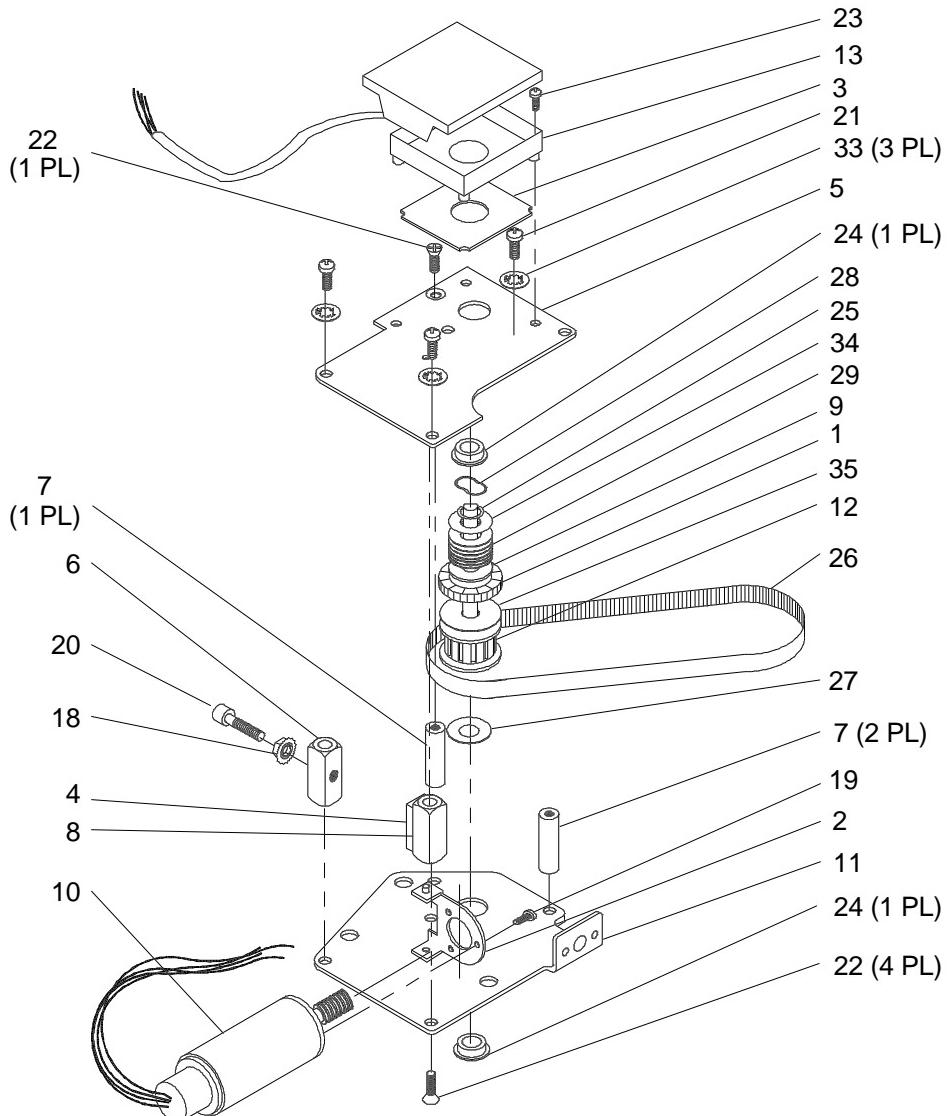
NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0127	1 EA	MOUNT, FAN
2	40.7108.0001	1 EA	FAN, SNGLE INLET BLOWER AC 110V (VL4)
3	52.6231.0001	1 EA	PLUG HOUSING, MNLOK PLUG 3POS
4	52.8258.0001	3 EA	CONTACT PIN, 20-14AWG MNLOK (LOOSE)
5	53.2001.0001	4 EA	NUT, 10-32, KEPS ZINC PLATED
6	53.6549.0001	4 EA	SCREW, 10-32X3/8"PPB



#### 4.2.2.9 Assy, Tilt Mechanism (VL4)

#### 22.4004.0001

NO.	PART NO.	QTY	DESCRIPTION
1	10.9620.0005	1 EA	WHEEL, WORM, REDUCTION, PAN/TILT
2	10.9620.0107	1 EA	MOUNT, MOTOR, PAN/TILT
3	10.9620.0270	1 EA	SEAL, ENCODER
4	10.9620.0293	1 EA	PAD, ANTI-BACKLASH, PTA
5	10.9628.0116	1 EA	MOUNT, ENCODER, TILT
6	10.9628.0117	1 EA	SPACER, ADJUSTMENT, BACKLASH, TILT
7	10.9628.0143	3 EA	STANDOFF, SPECIAL, RND, 6-32X5/16X.187
8	10.9628.0144	1 EA	STANDOFF, SPECIAL, SQR, TILT MECHANISM
9	10.9634.0051	1 EA	WASHER,"D", PTA
10	22.5007.0001	1 EA	ASSY, MAXON MOTOR
11	22.9628.0115	1 EA	ASSY, VL4 TILT BOTTOM PLATE
12	22.9628.0220	1 EA	ASSY, DRIVE SHAFT - PAN & TILT
13	45.5101.0001	1 EA	ENCODER 256 COUNT
14	52.6270.0001	1 EA	CONN HOUSING, MTA CLOSED END RED 5PIN
15	52.6300.0001	1 EA	CONN HOUSING, MTA CLOSED END Natrl 4PIN
16	52.6424.0004	1 EA	COVER, STRAIN RELIEF/4POS MTA
17	52.6424.0005	1 EA	COVER, STRAIN RELIEF/5POS MTA
18	53.2001.0001	1 EA	NUT, 10-32, KEPS ZINC PLATED
19	53.6513.0001	3 EA	SCREW, 2.5MM X 4MM
20	53.6515.0001	1 EA	SCREW, 10-32X3/4 SCB CAP
21	53.6522.0001	3 EA	SCREW, 6-32X1/4"PPZ
22	53.6591.0001	5 EA	SCREW, 6-32X1/4"PFZ
23	53.6592.0002	3 EA	SCREW, 4-40X1/2"SCB
24	54.1208.0001	2 EA	BEARING, 1/4"
25	54.1222.0002	1 EA	RING,RETAIN.,METRIC,FOR 9MM SHAFT
26	54.2004.0001	1 EA	BELT,TILT,VL4,1/5P,70T,.290W,KEVLAR
27	55.2110.0002	1 EA	WSHR, FLT STN ST.260ID.400OD.010THK
28	55.2123.0001	1 EA	SPRING, WAVE 1/4"
29	55.2128.0001	7 EA	SPRING, DISC, CLUTCH, VL5
30	55.2186.0001	2 EA	CABLE TIE, SMALL .10X4"
31	55.2197.0001	2 IN	HEAT SHRINK 3/8" BLACK
32	55.6526.0001	1 EA	GROMMET, 1/4"BORE 1/2"O.D/3/8"HOLE 1/16"
33	55.6538.0001	3 EA	WASHER, LOCK, #6 INTERNAL TOOTH
34	55.6677.0007	1 EA	WASHER, FLAT,.75OD X .383ID X.031TH-BLK0X
35	55.6677.0008	1 EA	WASHER, FLAT,S/S,.875OD X .3781

**Assy, Tilt Mechanism (VL4) (continued)**  
**22.4004.0001**

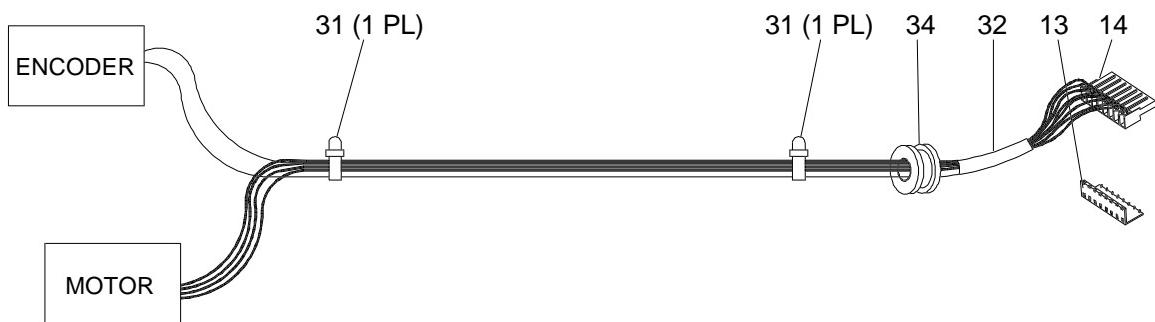
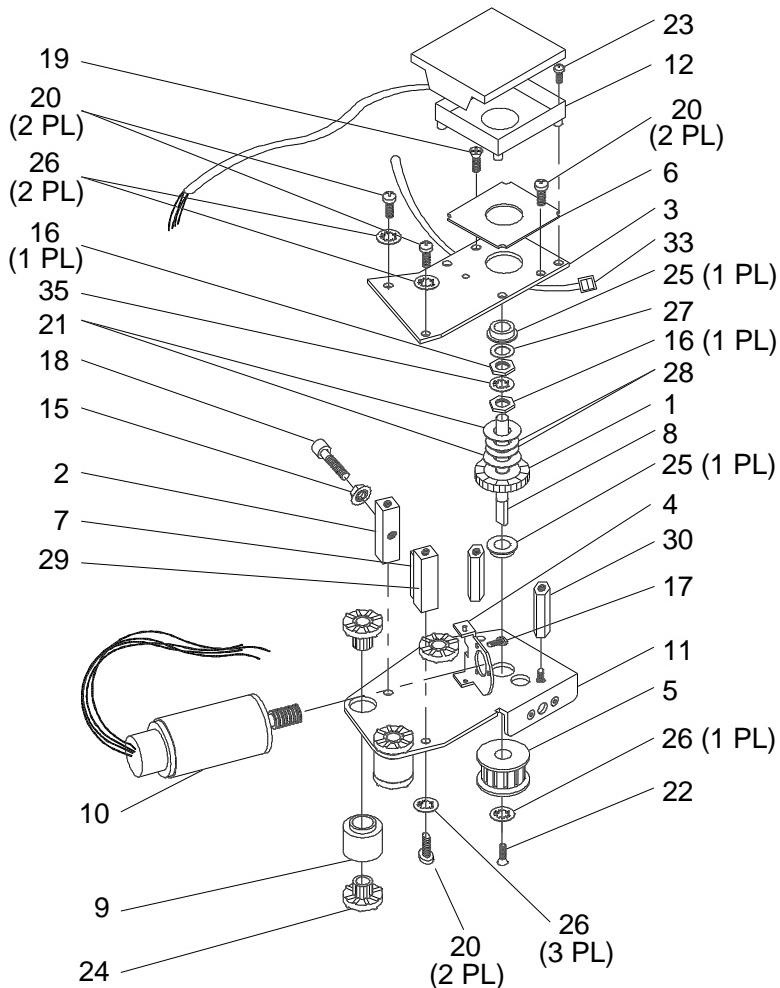
### 4.2.2.10 Assy, Pan Drive (VL4)

#### 22.4001.0001

NO.	PART NO.	QTY	DESCRIPTION
1	10.9620.0005	1 EA	WHEEL, WORM, REDUCTION, PAN/TILT
2	10.9620.0101	1 EA	SPACER, ADJUSTMENT, BACKLASH
3	10.9620.0105	1 EA	PLATE/MOUNT, BEARING/Encoder, PAN & TILT
4	10.9620.0107	1 EA	MOUNT, MOTOR, PAN/TILT
5	10.9620.0123	1 EA	PULLEY, DRIVE, PAN/TILT
6	10.9620.0270	1 EA	SEAL, ENCODER
7	10.9620.0293	1 EA	PAD, ANTI-BACKLASH, PTA
8	10.9620.0307	1 EA	SHAFT, CLUTCH (NON-ADJ) VL4 & VL2C PAN
9	10.9628.0183	3 EA	LEG, MOUNTING, PAN DRIVE
10	22.5007.0001	1 EA	ASSY, MAXON MOTOR
	10.9620.0006	1 EA	WORM, REDUCTION, PAN/TILT
	44.5007.0001	1 EA	MOTOR, MAXON W/TACH
	52.6284.0001	1 EA	HEADER, MTA FRCT LOK STRT POST 4 PIN
	55.6677.0002	1 EA	WASHER, .360OD X .123ID X .025THK, NYLON
11	22.9628.0114	1 EA	ASSY, VL4 PAN BOTTOM PLATE
	10.9628.0114	1 EA	PLATE, BOTTOM, PAN
	55.2134.0003	1 EA	PLATE, FLOATING NUT
12	45.5101.0001	1 EA	ENCODER 256 COUNT
13	52.6424.0008	1 EA	COVER, STRAIN RELIEF/8POS MTA
14	52.6434.2208	1 EA	CONN, CLOSED W/O TABS 22AWG 8 POS
15	53.2001.0001	1 EA	NUT, 10-32, KEPS ZINC PLATED
16	53.2005.0001	2 EA	NUT, WHEEL 3/8-32X3/32T
17	53.6513.0001	3 EA	SCREW, 2.5MM X 4MM
18	53.6515.0001	1 EA	SCREW, 10-32X3/4 SCB SCKT HD CAP
19	53.6516.0001	1 EA	SCREW, 10-32 X 3/8"PFZ
20	53.6517.0001	6 EA	SCREW, 10-32 X 3/8"PPZ
21	53.6573.0001	2 EA	WASHER, SS, .750OD X.375ID X.060
22	53.6591.0001	1 EA	SCREW, 6-32X1/4"PFZ
23	53.6592.0002	4 EA	SCREW, 4-40X1/2"SCB
24	54.1201.0001	6 EA	BUSHING
25	54.1208.0001	2 EA	BEARING, 1/4"
26	55.2114.0001	6 EA	WASHER, LCK INT TTH #10
27	55.2123.0001	1 EA	SPRING, WAVE 1/4"
28	55.2124.0001	2 EA	SPRING, CURVE (HIGH CARBON)
29	55.2125.0001	1 EA	STANDOFF, 3/8"SQR 10-32x1 5/16"
30	55.2133.0001	2 EA	STANDOFF, 5/16"HEX 10-32X1-5/16"SP
31	55.2186.0001	2 EA	CABLE TIE, SMALL .10X4"

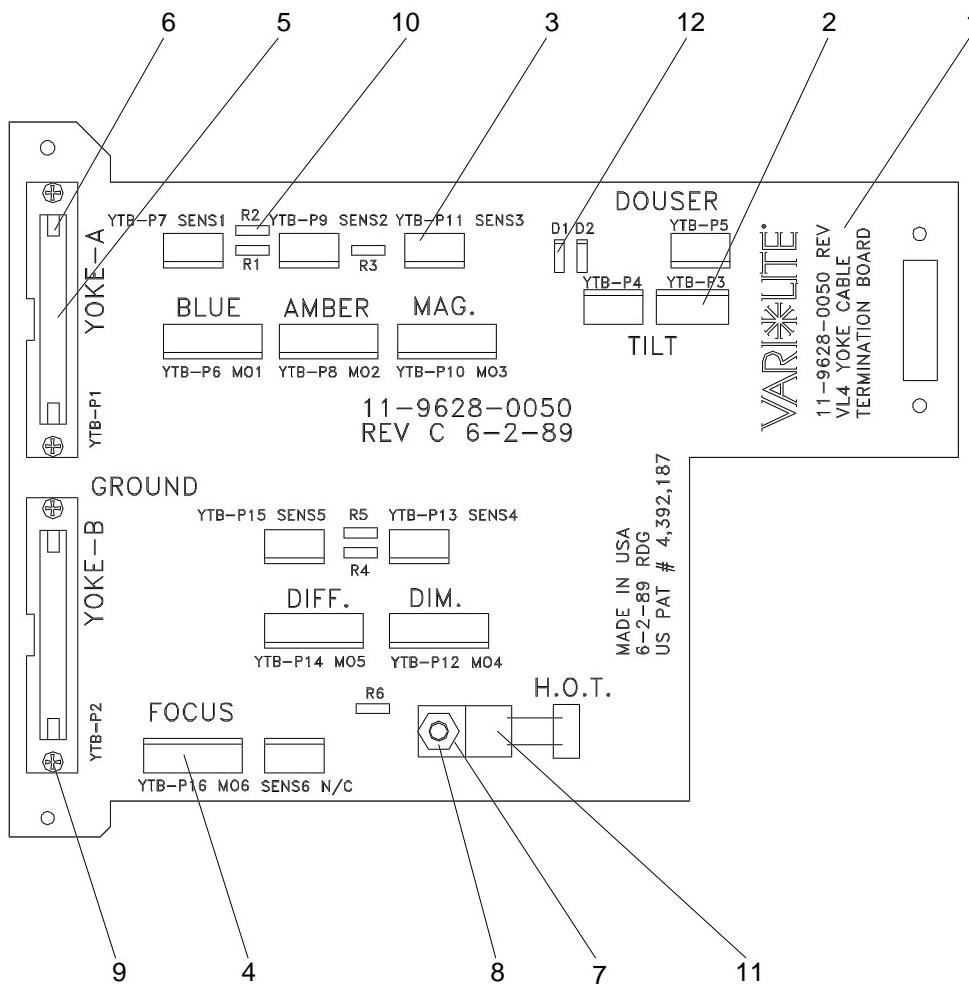
**Assy, Pan Drive (VL4) (continued)**  
**22.4001.0001**

NO.	PART NO.	QTY	DESCRIPTION
32	55.2197.0001	2 IN	HEAT SHRINK 3/8" BLACK
33	55.6592.0001	1 EA	CABLE TIE, MEDIUM 10 X 8"
34	55.6602.0001	1 EA	GROMMET, 1/4"0 THRU/3/8" HOLE 1/8" PLATE
35	55.6618.0001	1 EA	WASHER, LOCK INT TTH 1/2" OD X 3/8" ID



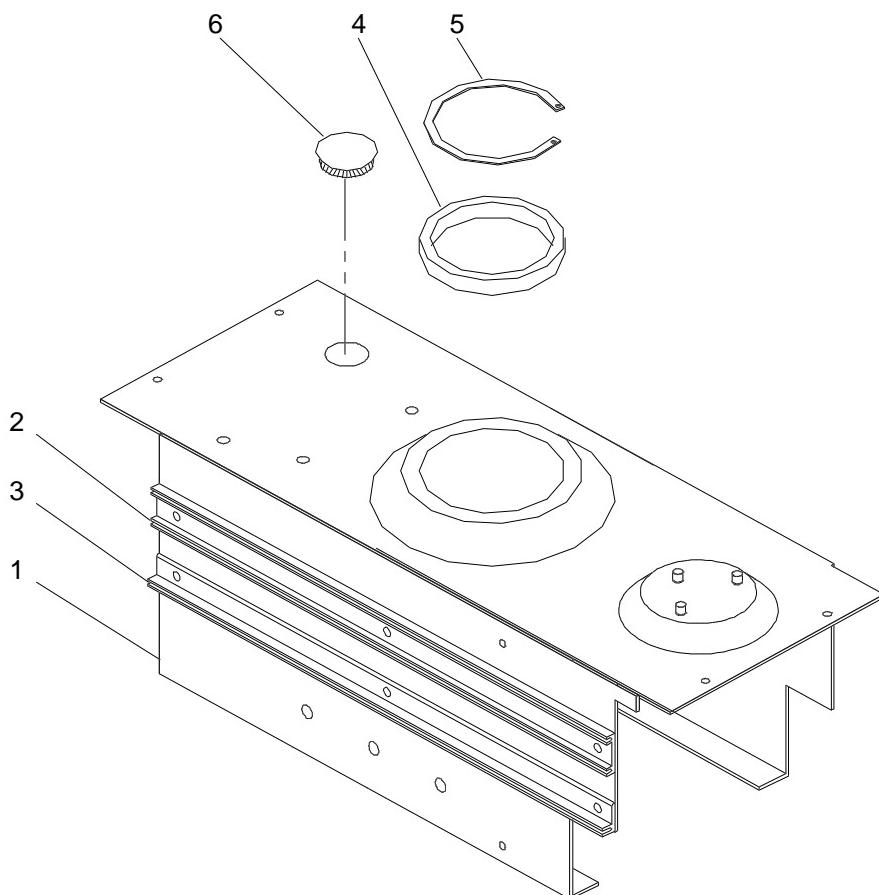
### 4.2.2.11 PCB Assy, VL4 Yoke Cable Term (YTB) 24.9628.0049

NO.	PART NO.	QTY	DESCRIPTION
1	11.9628.0050	1 EA	PCB, VL4 YOKE CABLE TERMINATION
2	52.6259.0001	1 EA	HEADER, MTA FRCT LOK STRT POST 5PIN
3	52.6284.0001	8 EA	HEADER, MTA FRCT LOK STRT POST 4PIN
4	52.6296.0001	6 EA	HEADER, MTA FRCT LOK STRT POST 8PIN
5	52.6420.0026	2 EA	PIN HEADER ASSY, WO/LATCH 26POS
6	52.6421.0027	4 EA	LATCH w/o PUSH TABS for Pin Header Assy
7	53.2003.0001	1 EA	NUT, 4-40, KEP ZINC PLATED
8	53.6591.0001	1 EA	SCREW, 6-32X1/4"PFZ
9	53.6633.0001	4 EA	SCREW, 4-1/4"PPZ SHT METAL
10	60.1431.1803	6 EA	RES, 1/4W 5% 180 CF
11	74.1006.0004	1 EA	SWITCH, THERMAL 100*C PCB MOUNT
12	82.4312.0105	2 EA	DIODE, FAST ,MUR105/110 50V 1A



### 4.2.2.12 Assy, VL4 Yoke Bearing Frame 22.9628.0057

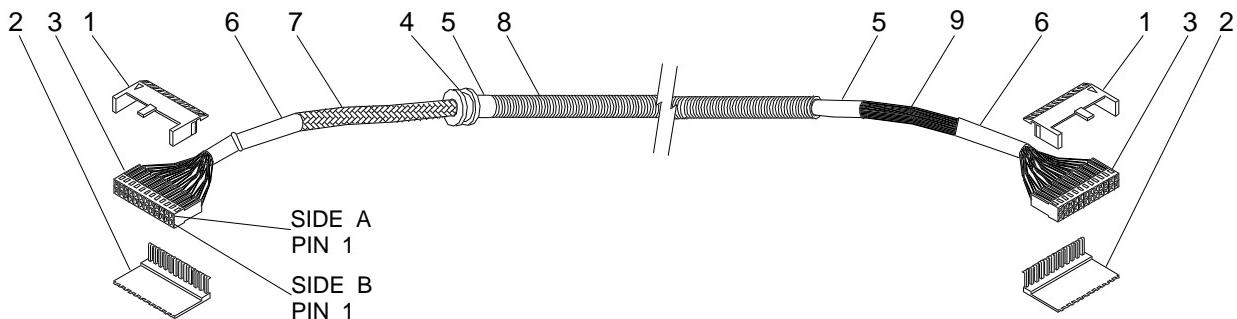
NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0057	1 EA	FRAME, BEARING, YOKE
2	10.9628.0094	1 EA	GUIDE, CARD, INSIDE
3	10.9628.0168	2 EA	GUIDE, CARD, MODIFIED PCG-3, LVS
4	53.6506.0001	2 EA	BEARING, TORQUE TUBE, 2.6250OD X 2.0620ID
5	54.1206.0001	2 EA	RING, RETAINING 2.521" ID
6	55.6662.0001	1 EA	HOLE PLUG 3/4" BRASS W/BLK OXIDE



### 4.2.2.13 Cable Assy, Yoke "A" 38 Inch (VL4)

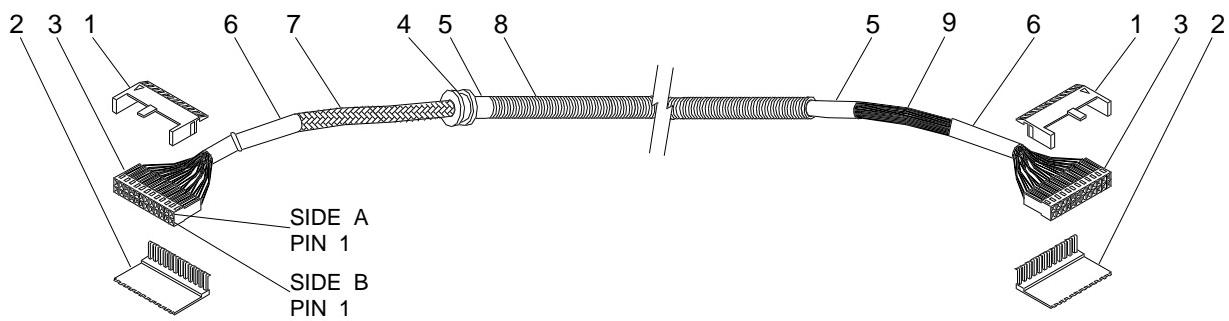
**25.9628.0145**

NO.	PART NO.	QTY	DESCRIPTION
1	52.6226.0001	2 EA	COVER, BACK MT 26POS 30-26AWG
2	52.6226.0002	2 EA	COVER, EJECT STYLE MT 26POS 26-22AWG
3	52.6228.0001	2 EA	CONN HOUSING, MT RECEPT 26POS
4	55.2182.0001	1 EA	GROMMET
5	55.2197.0001	4 IN	HEAT SHRINK 3/8" BLACK
6	55.2197.0002	3 IN	HEAT SHRINK 3/8" YELLOW
7	55.6699.0003	5 IN	SLEEVING, POLY EXP BRAIDED 1/2" NOM.DIA.
8	55.9628.0175	1 EA	SPRING, YOKE CABLE, 24" (VL4)
9	73.7083.0001	38 IN	CBL, 24AWG 26COND NO JCKT/VL4 YOKE



#### 4.2.2.14 Cable Assy, Yoke "B" 41 Inch (VL4) 25.9628.0147

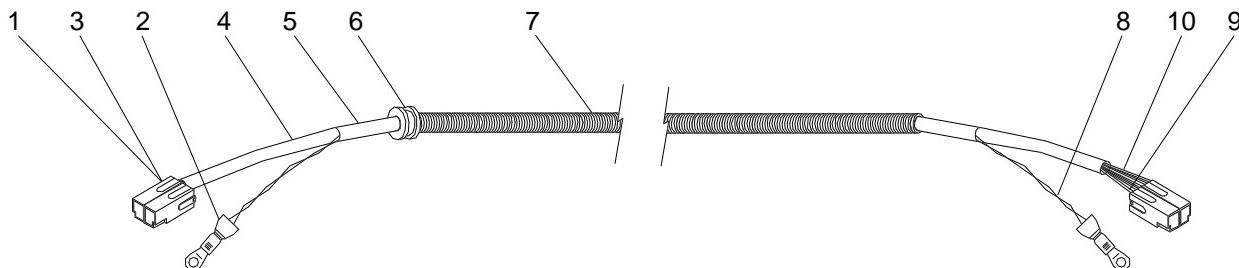
NO.	PART NO.	QTY	DESCRIPTION
1	52.6226.0001	2 EA	COVER, BACK MT 26POS 30-26AWG
2	52.6226.0002	2 EA	COVER, EJECT STYLE MT 26POS 26-22AWG
3	52.6228.0001	2 EA	CONN HOUSING, MT RECEPT 26POS
4	55.2182.0001	1 EA	GROMMET
5	55.2197.0001	4 IN	HEAT SHRINK 3/8" BLACK
6	55.2197.0003	3 IN	HEAT SHRINK, 3/8" BLUE
7	55.6699.0003	7 IN	SLEEVING, POLY EXP BRAIDED 1/2" nom.dia.
8	55.9628.0175	1 EA	SPRING, YOKE CABLE, 24" (VL4)
9	73.7083.0001	41 IN	CBL, 24AWG 26COND NO JCKT/VL4 YOKE



### 4.2.2.15 Lamp Wire Assy, A & B (VL4)

**25.9628.0149**

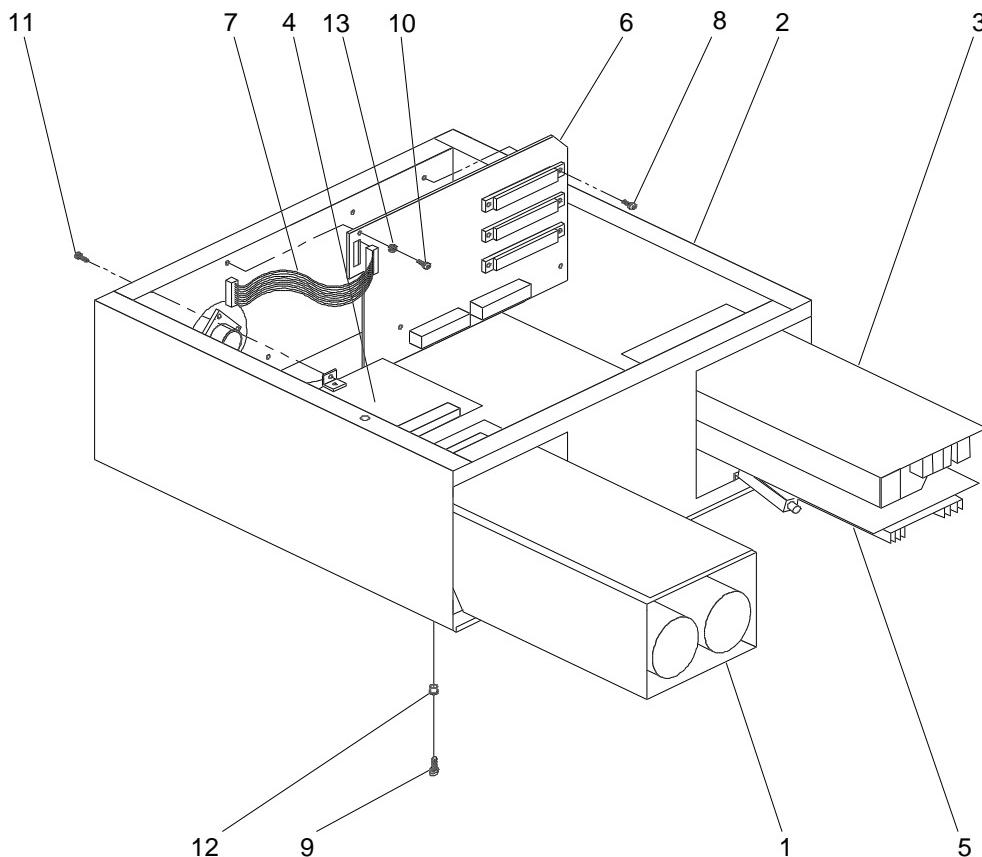
NO.	PART NO.	QTY	DESCRIPTION
1	52.6362.0001	4 EA	CONN HOUSING, 30 SERIES RED
2	52.8231.0003	2 EA	TERM, RING #6 22-18AWG (VL 1) (LOOSE)
3	52.8247.0002	4 EA	CRIMP CONTACT, S30 TIN (LOOSE)
4	55.2200.0002	7 IN	SLEEVING,SIL RUB COATED FBRGLAS .162ID
5	55.6695.0003	4 IN	HEAT SHRINK, ADHESIVE 1/4" BLACK
6	55.6698.0001	1 EA	GROMMET, 3/16"IDx3/4"ODx3/8"THKx1/8"GRV
7	55.9628.0174	1 EA	SPRING, LAMP WIRE, 24" (VL4)
8	73.7046.0002	80 IN	WIRE, 24AWG STRND GREEN
9	73.7084.0000	40 IN	WIRE, 24AWG BLK 5COND W/BINDER
10	73.7084.0002	40 IN	WIRE, 24AWG RED 5COND W/BINDER



### 4.2.3 Chassis Assembly

#### 4.2.3.1 Assy, VL4 Chassis 21.9628.0001

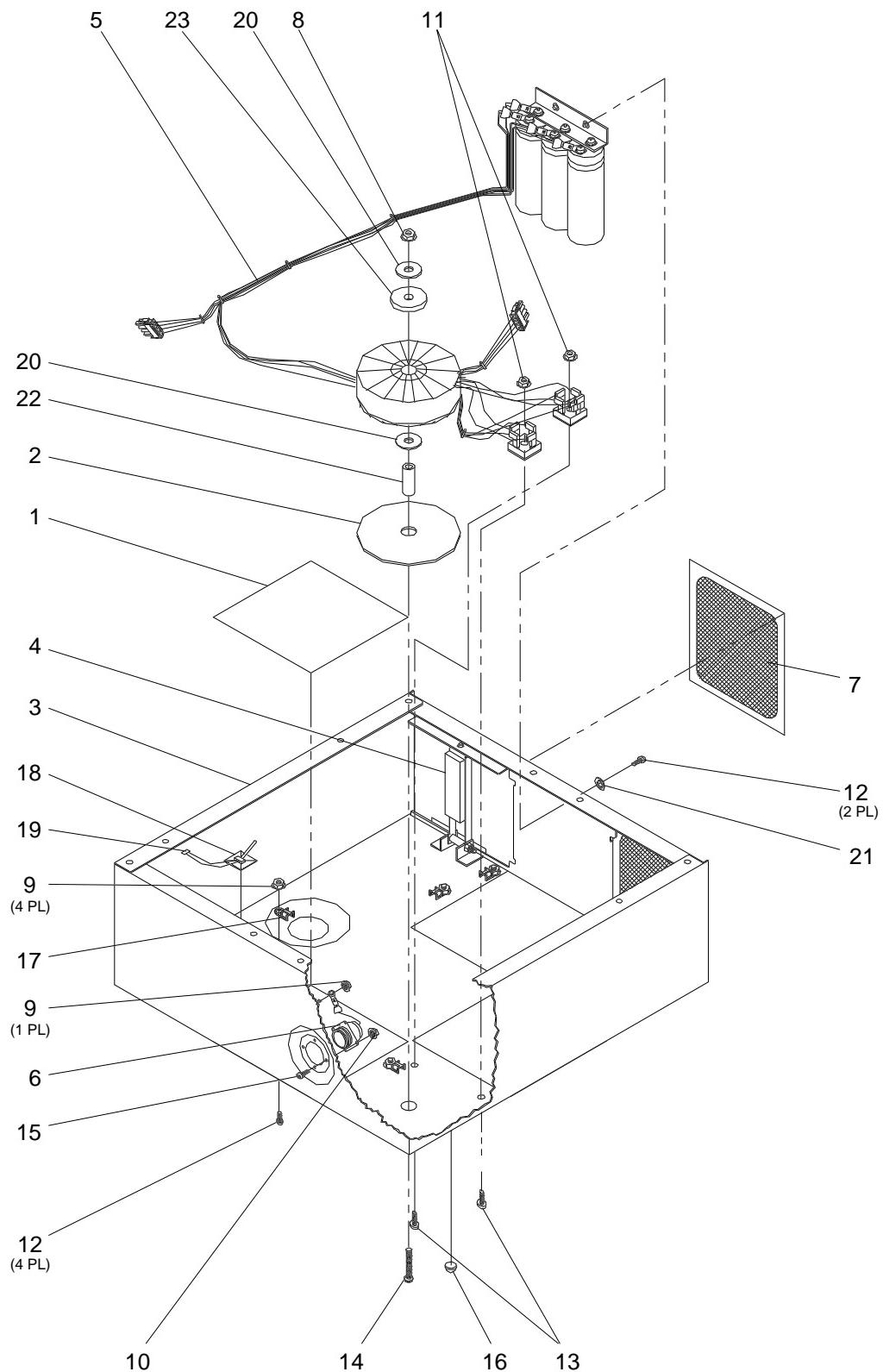
NO.	PART NO.	QTY	DESCRIPTION
1	21.9628.0020	1 EA	ASSY, ARC PWR SUPPLY + 400WATT (APS+)
2	22.4000.0056	1 EA	ASSY, VL4 UPPER ENCLOSURE
3	23.9628.0232	1 EA	ELEC.ASSY, VL4 LAMP CTRL (UCB/IFB)
4	24.9628.0026	1 EA	PCB ASSY, VL4 VOLTAGE SELECTOR (VSB)
5	24.9628.0045	1 EA	PCB ASSY, VL4 LOW VOLTAGE SUPPLY (LVS)
6	24.9628.0053	1 EA	PCB ASSY, VL4 MOTHER (MBD)
7	25.9628.0152	1 EA	CABLE ASSY, MB-VSB (LK 1) VL4
8	53.6520.0001	6 EA	SCREW, 4-40 X 3/8" PPZ
9	53.6524.0002	1 EA	SCREW, 6-32X5/16"PPB
10	53.6596.0001	3 EA	SCREW, 4-40X5/16"PPZ
11	53.6600.0001	1 EA	SCREW, 4-40X 5/16"PPB
12	55.6525.0001	1 EA	BUSHING, NYLON SHOULDER, #6X.170DX..125L
13	55.6537.0001	3 EA	WASHER, LOCK #4, INTERNAL TOOTH



### 4.2.3.2 Assy, VL4 Upper Enclosure

#### 22.4000.0056

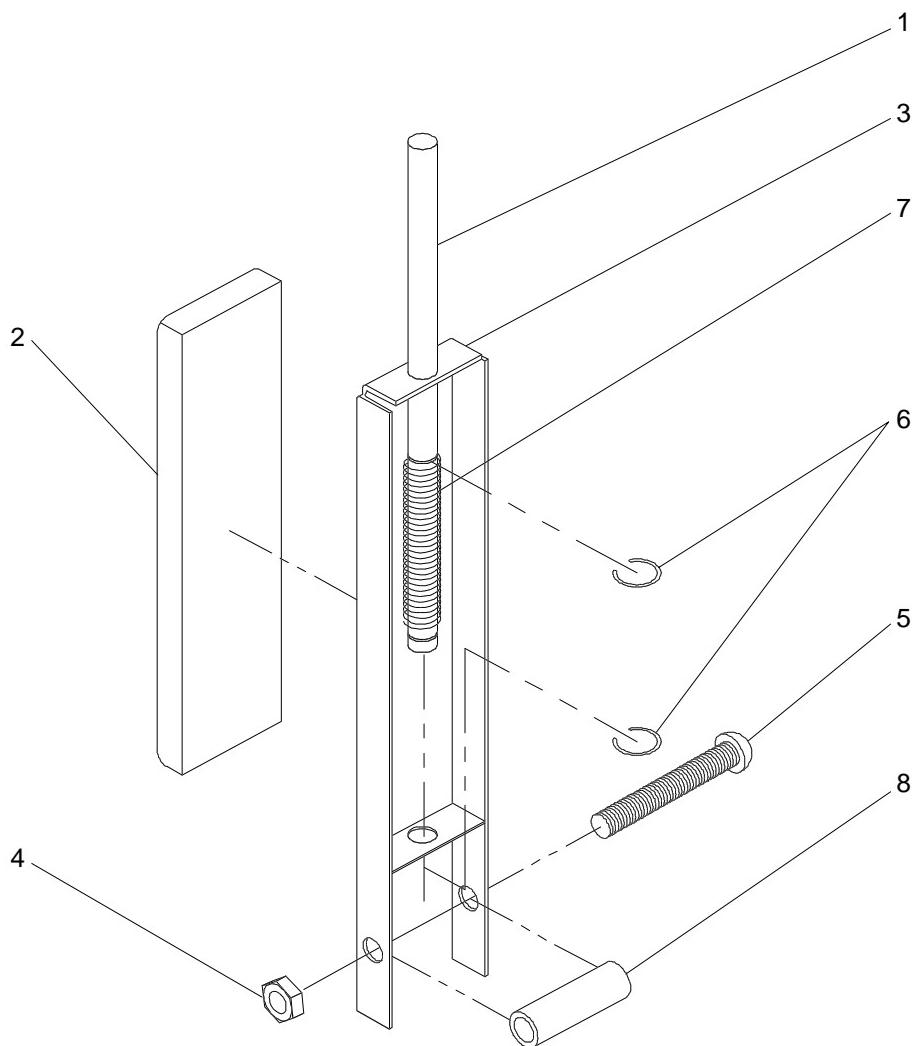
NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0164	4 EA	COVER, FOOT, CHASSIS
2	10.9628.0186	1 EA	PAD, MOUNTING, TRANSFORMER
3	22.9628.0056	1 EA	ASSY, VL4 UPE CHASSIS
	10.9628.0056	1 EA	CHASSIS, ELECTRONICS
	10.9628.0095	1 EA	GUIDE, CARD, OUTSIDE
	10.9628.0130	2 EA	GUIDE, CARD, MODIFIED PCG-3
	22.9637.0093	4 EA	ASSY, FASTENER, TRUSS HOOK
	10.9620.0269	1 EA	STOP, TRUSS HOOK
	10.9637.0066	1 EA	TRUSS HOOK FASTENER, TOP
	10.9637.0067	1 EA	TRUSS HOOK FASTENER, BOTTOM
	10.9637.0092	1 EA	SPACER, TRUSS HOOK FASTENER
	55.6700.0001	1 EA	HANDLE. SPRING LOADED, 180°SWING AL.
4	22.9628.0171	1 EA	ASSY, CARD RETAINER
5	23.9628.0005	1 EA	ASSY, TRANSFORMER/CAPACITOR (VL4)
6	25.9628.0150	1 EA	CABLE ASSY, INPUT CONN. WIRE (VL4)
7	40.7101.0001	2 EA	FILTER, AIR (200S)
8	53.2001.0001	1 EA	NUT, 10-32, KEPS ZINC PLATED
9	53.2002.0001	5 EA	NUT, 6-32 KEP ZINC PLATED
10	53.2003.0001	4 EA	NUT, 4-40, KEP ZINC PLATED
11	53.2004.0001	2 EA	NUT, 8-32, KEP
12	53.6524.0002	6 EA	SCREW, 6-32X5/16"PPB
13	53.6546.0001	2 EA	SCREW, 8-32 X 5/8" PPB
14	53.6564.0001	1 EA	SCREW, 10-32x2"PPB
15	53.6600.0001	4 EA	SCREW, 4-40X5/16"PPB
16	54.1206.0002	2 EA	BUMPER, POLYUR SELF STICKING
17	55.2178.0001	4 EA	CABLE ANCHOR MOUNT, #8 SCREW MOUNTING
18	55.2179.0003	1 EA	SADDLE, CABLE, ADHESIVE BACKED
19	55.2186.0001	15 EA	CABLE TIE, SMALL .10X4"
20	55.6522.0001	2 EA	WASHER, FLAT, .750 OD, .192 ID
21	55.6538.0001	2 EA	WASHER, LOCK, #6 INTERNAL TOOTH
22	55.6657.0001	1 EA	STANDOFF, 1/2"RND 10.32x1" (VL1)
23	55.6696.0003	1 EA	BUMPER, RUBBER 1.1/8"O.D. 80 Duro Black

**Assy, VL4 Upper Enclosure (continued)**  
**22.4000.0056**

### 4.2.3.3 Assy, Card Retainer

#### 22.9628.0171

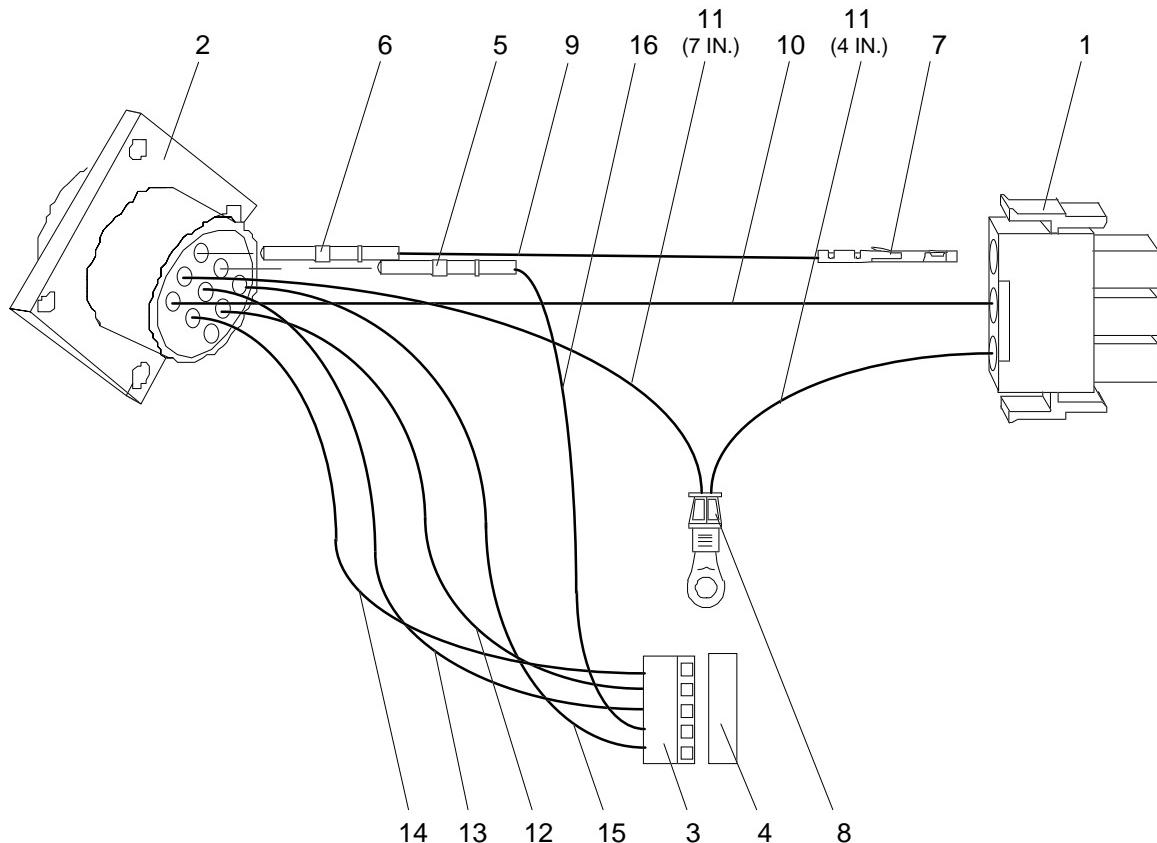
NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0170	1 EA	PLUNGER, CARD RETAINER
2	10.9628.0184	1 EA	PAD, CARD RETAINER
3	22.9628.0169	1 EA	CARD RETAINER
4	53.2001.0003	1 EA	NUT, 10-32 NYLON INSERT
5	53.6514.0001	1 EA	SCREW, 10-32X1 1/4"PPB
6	55.2234.0002	2 EA	E-RING, .187 SHAFT DIA.
7	55.6568.0014	1 EA	SPRING, .240ODX2.00LG W/.022DIA SS WIRE
8	55.6584.0001	1 EA	SPACER, 3/8"X5/8" BLACK



#### 4.2.3.4 Cable Assy, Input Conn. Wire (VL4)

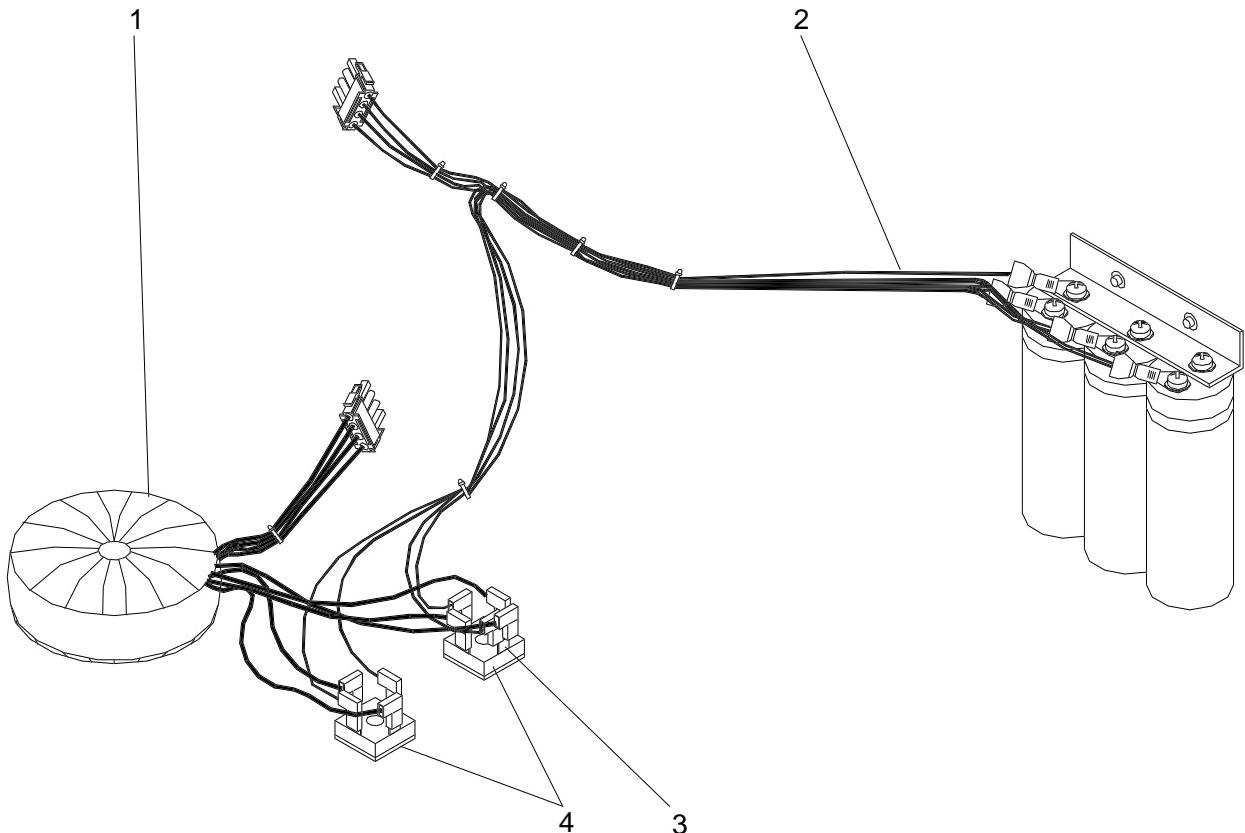
**25.9628.0150**

NO.	PART NO.	QTY	DESCRIPTION
1	52.6231.0001	1 EA	PLUG HOUSING, MNLOK PLUG 3POS
2	52.6251.0001	1 EA	RECEPT, 9POS CHASSIS MNT LAMP
3	52.6270.0001	1 EA	CONN HOUSING, MTA CLOSED END RED 5PIN
4	52.6424.0005	1 EA	COVER, STRAIN RELIEF/5POS MTA
5	52.8277.0001	5 EA	CONTACT PIN, 22AWG GLD (LOOSE) TYPE 3+
6	52.8276.0001	3 EA	CONTACT PIN, TIN 18-16AWG (LOOSE) TYPE 3+
7	52.8256.0001	3 EA	CONTACT SCKT, 20AWG TIN MNLOK (LOOSE)
8	52.8232.0001	1 EA	TERM, RING #10 16-14AWG (LOOSE)
9	73.7006.0001	7 IN	WIRE, 16AWG STRND BLK STRND UL1061
10	73.7007.0001	7 IN	WIRE, 16AWG STRND WHT STRND UL1061
11	73.7008.0001	11 IN	WIRE, 16AWG STRND GRN STRND UL1061
12	73.7018.0001	6 IN	WIRE, 22AWG STRND RED
13	73.7030.0001	6 IN	WIRE, 22AWG STRND GRAY
14	73.7031.0001	6 IN	WIRE, 22AWG STRND BLACK
15	73.7046.0001	6 IN	WIRE, 22AWG STRND GREEN
16	73.7052.0001	6 IN	WIRE, 22AWG STRND WHITE



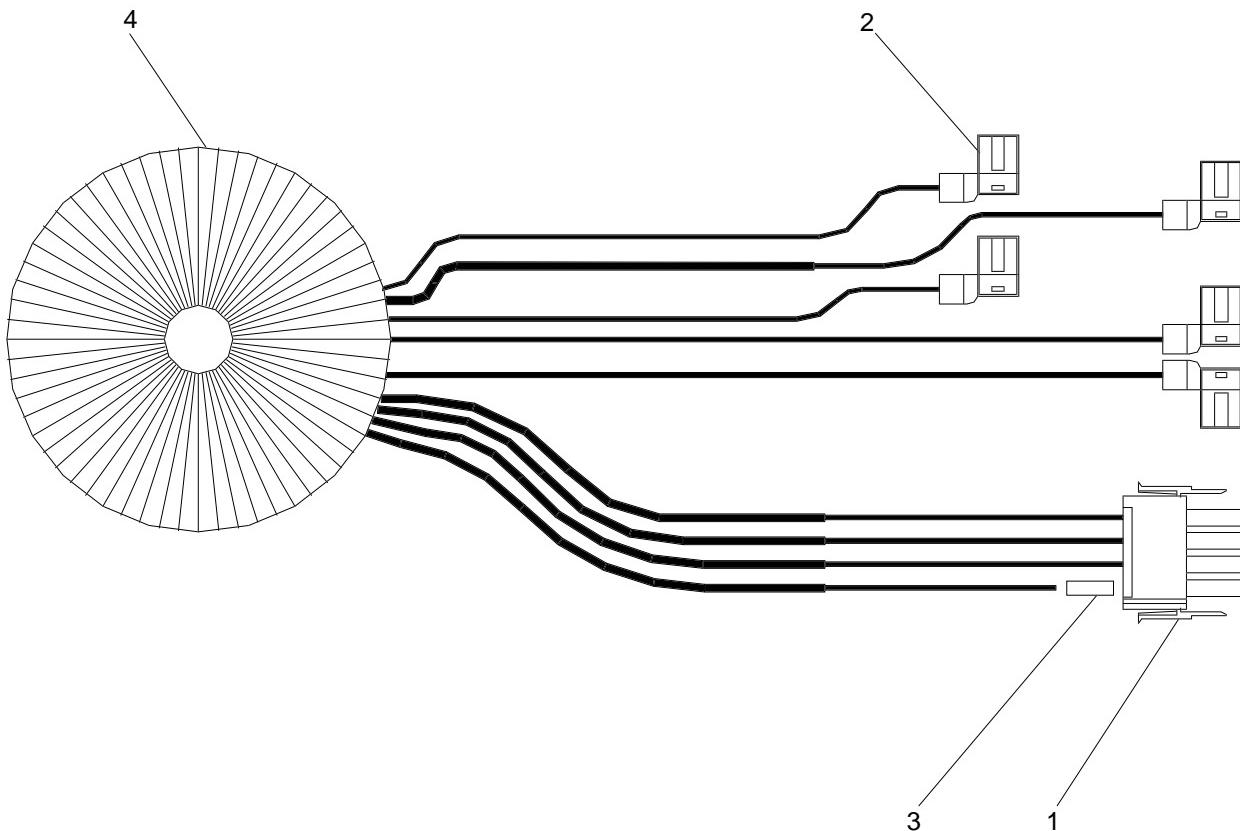
#### 4.2.3.5 Assy, Transformer/Capacitor (VL4) 23.9628.0005

NO.	PART NO.	QTY	DESCRIPTION
1	23.9628.0159	1 EA	ASSY, CONNECTORIZED TRANSFORMER (VL4)
2	23.9628.0234	1 EA	ASSY, MOUNTED CAPACITOR (VL4)
3	52.8217.0001	1 EA	TERM, DUPLEX .250 NON. INS
4	82.4303.2506	2 EA	BRIDGE RECTIFIER, MDA2506 600V 25A



#### 4.2.3.6 Assy, Connectorized Transformer (VL4) 23.9628.0159

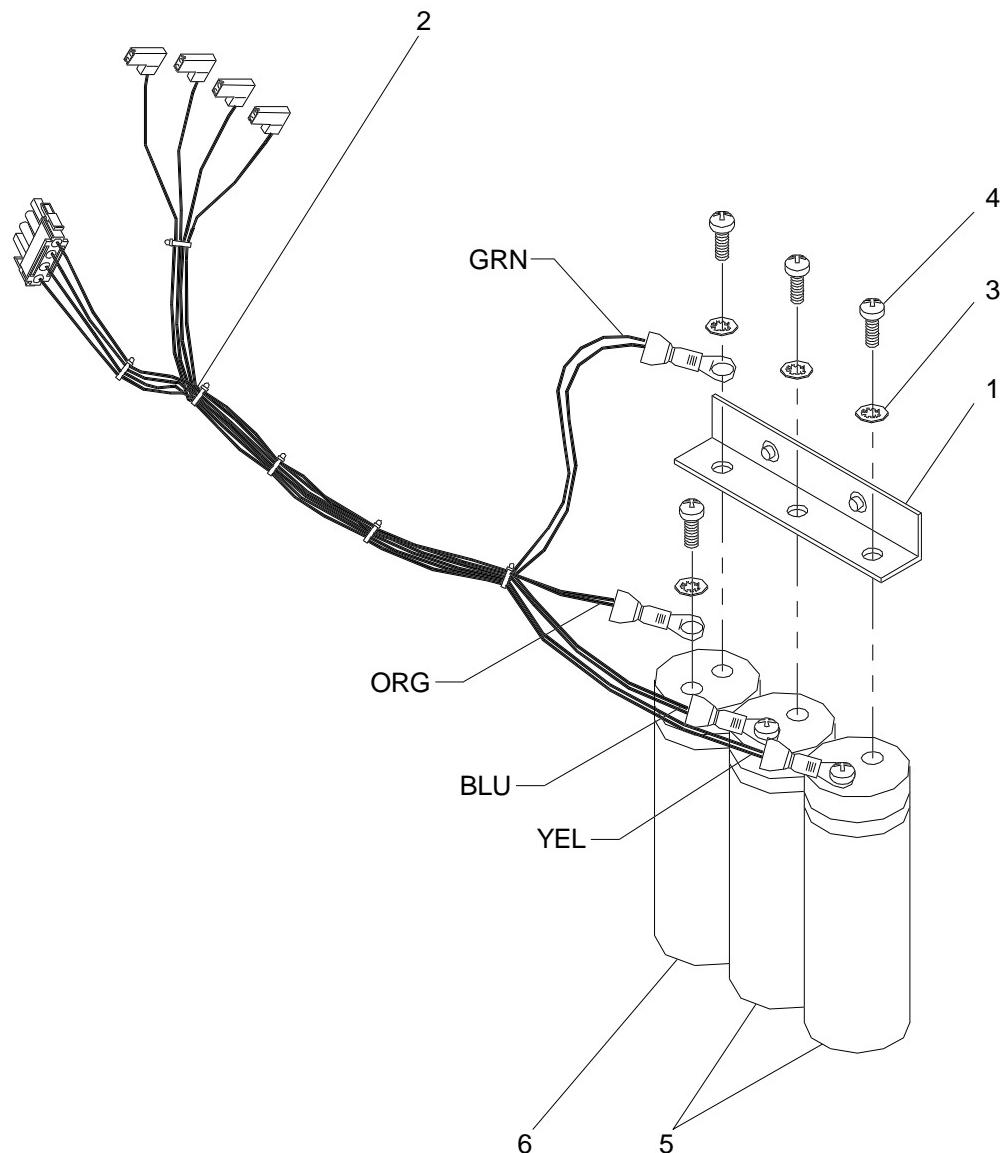
NO.	PART NO.	QTY	DESCRIPTION
1	52.6319.0001	1 EA	PLUG HOUSING, MNLOK 4POS
2	52.8244.0002	5 EA	FASTON RECEPT FLAG,.250 16-14AWG (LOOSE)
3	52.8258.0001	4 EA	CONTACT PIN, 20-14AWG MNLOK (LOOSE)
4	68.4518.0004	1 EA	TRANSFORMER, VL4 110/220V LAMP UNIT



### 4.2.3.7 Assy, Mounted Capacitor (VL4)

**23.9628.0234**

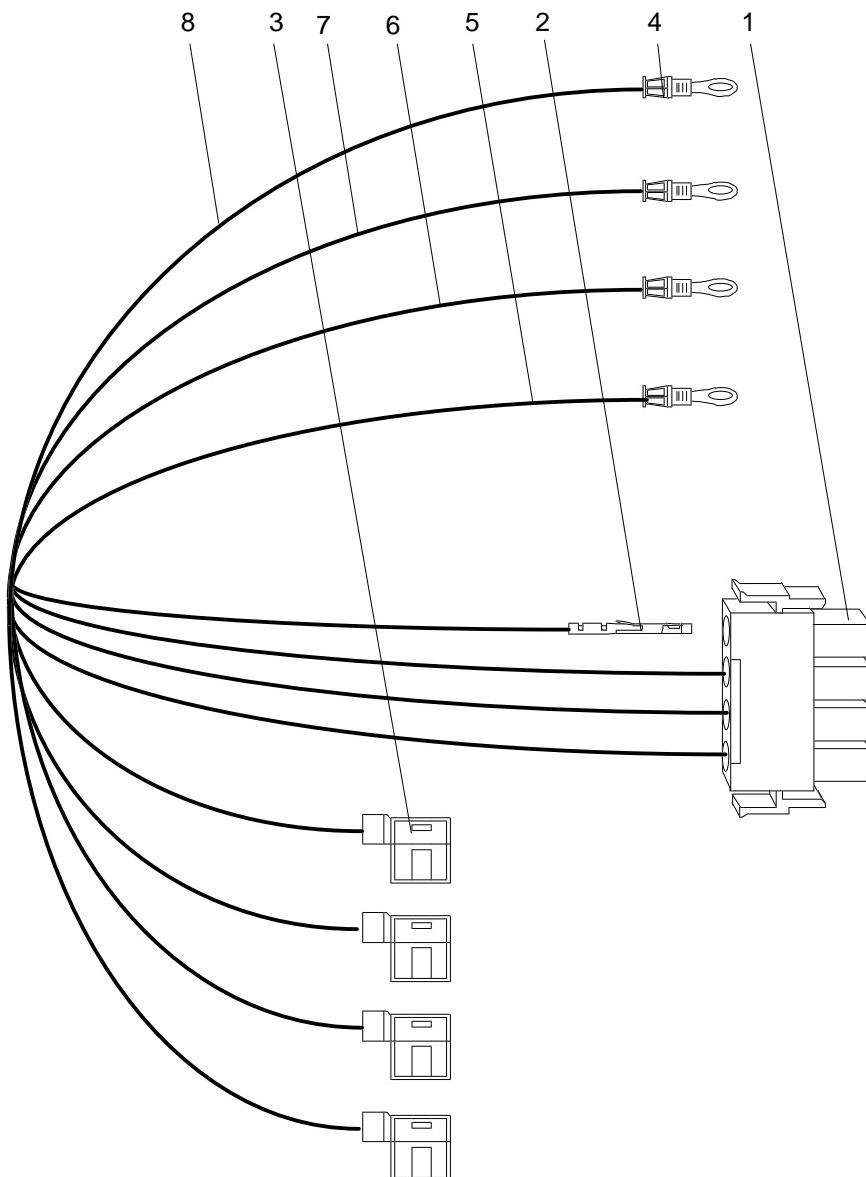
NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0122	1 EA	BRACKET, MOUNTING, CAPACITOR
2	25.9628.0156	1 EA	CABLE ASSY, XFRMR & CAPACITOR (VL4)
3	55.2114.0001	6 EA	WASHER, LCK INT TTH #10
4	55.6564.0001	6 EA	SCREW, 10.32X5/16"PPZ
5	62.2096.1900	2 EA	CAP,19000UF, 40V,RAD,ALUMNUM, .500",REF
6	62.2097.5300	1 EA	CAP,53000UF, 15V,RAD,ALUMNUM, .500",REF



### 4.2.3.8 Cable Assy, Transformer & Capacitor (VL4)

**25.9628.0156**

NO.	PART NO.	QTY	DESCRIPTION
1	52.6319.0001	1 EA	PLUG HOUSING, MNLOK 4POS
2	52.8256.0001	4 EA	CONTACT SCKT, 20AWG TIN MNLOK (LOOSE)
3	52.8244.0002	4 EA	FASTON RECEPT FLAG,.250 16-14AWG (LOOSE)
4	52.8232.0001	4 EA	TERM, RING #10 16-14AWG (LOOSE)
	55.2186.0001	8 EA	CABLE TIE, SMALL .10X4" (Not Shown)
5	73.7008.0001	47 IN	WIRE, 16AWG STRND GREEN UL1061
6	73.7011.0001	48 IN	WIRE, 16AWG STRND ORANGE UL1061
7	73.7013.0001	49 IN	WIRE, 16AWG STRND BLUE UL1061
8	73.7042.0001	50 IN	WIRE, 16AWG STRND YELLOW UL1061



### 4.2.3.9 PCB Assy, VL4 Voltage Selector (VSB)

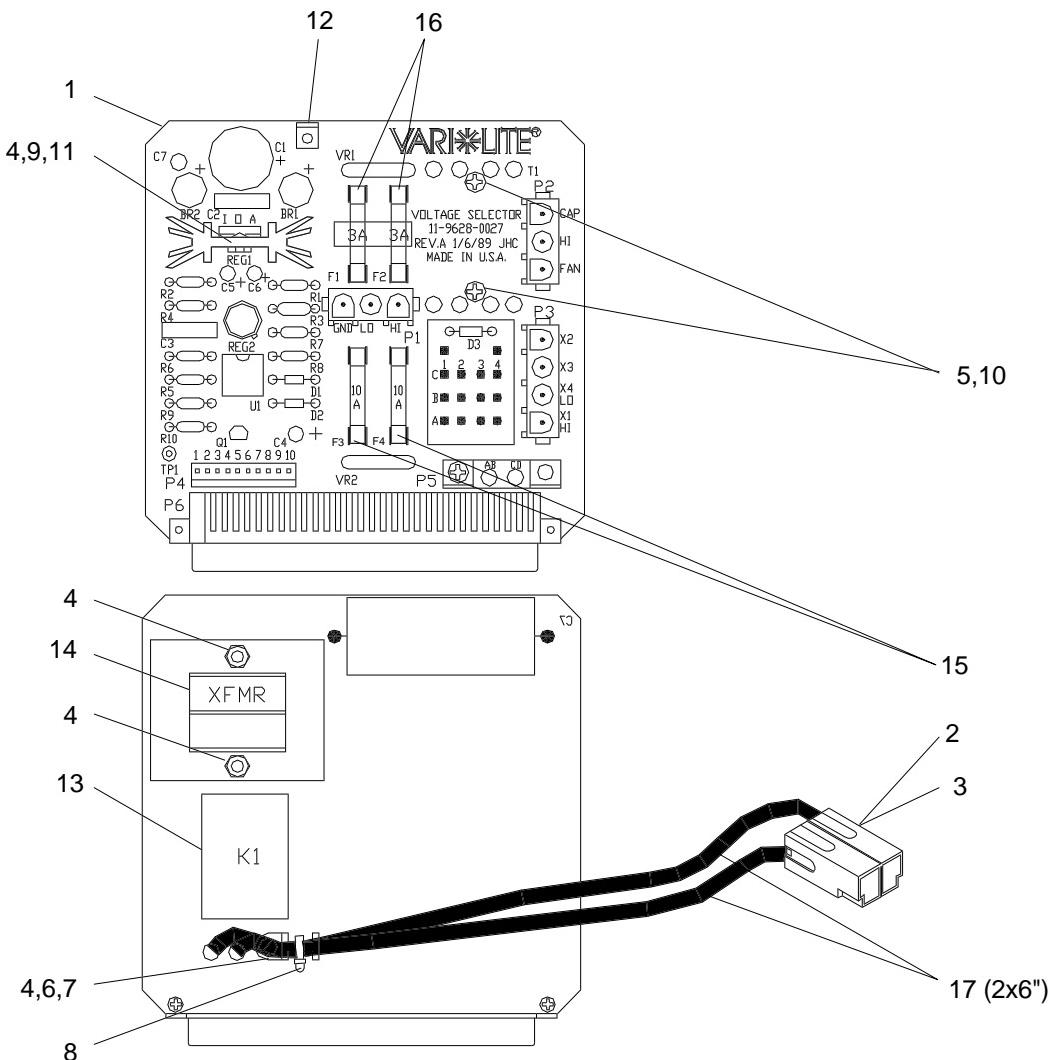
#### 24.9628.0026

NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	11.9628.0027	1 EA		PCB, VL4 VOLTAGE SELECTOR
2	52.6362.0001	2 EA		CONN HOUSING, 30 SERIES RED
3	52.8247.0002	2 EA		CRIMP CONTACT, S30 TIN (LOOSE)
4	53.2003.0001	4 EA	AP: REG1, P5	NUT, 4-40, KEP ZINC PLATED
5	53.6581.0001	2 EA		SCREW, 4-40X1 3/8"PPZ
6	53.6596.0001	1 EA	AP: REG1, P5	SCREW, 4-40X5/16"PPZ
7	55.2178.0001	1 EA		CABLE ANCHOR MOUNT, #8 SCREW MOUNTING
8	55.2186.0001	1 EA		CABLE TIE, SMALL .10X4"
9	55.2203.0001	1 EA		SCREW, 4-40X1/4"PPZ
10	55.2204.0001	2 EA		WASHER, NYLON #4
11	55.6509.0001	1 EA	AP: REG1	WASHER, SHOULDER (HEATSINK)
12	55.6532.0001	1 EA	VSB MTG BRACKET	BRACKET, UNIVERSAL
13	66.4502.0001	1 EA	K1 (BACK SIDE)	RELAY, 4PDT, 5A, 12VDC, PC. MNT, SEALED
14	68.4504.0001	1 EA	T1 (BACK SIDE)	XFMR,5.6 VA, 2 PRI, 2 SEC, AC SLCT BD
15	70.3723.0001	2 EA	F3, 4	FUSE, 10AMP, 125V
16	70.3723.0003	2 EA	F1, 2	FUSE, 3A, 250V,5X20MM, GLASS
17	73.7027.0018	12 IN		WIRE, 18AWG 30KV WHT
	50.2708.0001	1 EA	XU1	SOCKET, 8PIN DIP
	51.5001.0001	1 EA	AP: REG1	HEATSINK, TO-220 1" W/PINS
	51.5006.0001	1 EA	AP: REG1	INSULATOR, TO-220
	51.5011.0001	1 EA	AP: REG2	MOUNTING PAD, TO-5
	52.6230.0001	1 EA	P1	PIN HEADER ASSY, MNLOK MALE 3CIR
	52.6357.0001	1 EA	P4	HEADER, MTA FRCT LOK STRT POST 10PIN
	52.6370.0003	1 EA	P2	SOCKET HEADER ASSY, MNLOK FMLE 3CIR
	52.6370.0004	1 EA	P3	SOCKET HEADER ASSY, MNLOK FMLE 4CIR
	52.6385.0001	1 EA	P6	CONN, EURO 64CONTACTS TYPE "R"
	52.8283.0001	1 EA	TP1	TERM, SWAGE MT.TURRET
	53.6530.0002	1 EA	AP: BRACKET	RIVET, POP 1/8"OD X .063 -.125 GR.LENGTH
	53.6633.0001	2 EA		SCREW, 4-1/4"PPZ SHT METAL
	55.6691.0001	2 EA	AP: BR1, 2	PAD, MNTG. RECTIFIER BRIDGE (VL4)
	60.1230.2003	1 EA	R3	RES, 1/4W 1% 200K MF
	60.1230.5363	1 EA	R4	RES, 1/4W 1% 5.36K
	60.1421.4701	2 EA	R9, 10	RES, 1/4W 5% 4.7K CF
	60.1422.1001	2 EA	R2, 5	RES, 1/4W 5% 1K CF
	60.1423.1004	1 EA	R8	RES, 1/4W 5% 1MEG CF
	60.1424.1005	1 EA	R7	RES, 1/4W 5% 10K CF
	60.1426.1003	1 EA	R6	RES, 1/4W 5% 100K CF
	60.1428.1203	1 EA	R1	RES, 1/4W 5% 120 CF
	62.2005.0001	2 EA	C2, 3	CAP, .01UF, 630V,RAD,POLYEST, .400", 10%
	62.2017.0105	2 EA	C5, 6	CAP, 1.0UF, 50V,RAD,TANTALM, .125", 10%
	62.2027.0475	1 EA	C4	CAP, 4.7UF, 35V,RAD,TANTALM, .125", 10%
	62.2030.0505	1 EA	C7 (BACK SIDE)	CAP, 5UF, 200V,AXL,POLYEST, 1.75", 10%

## PCB Assy, VL4 Voltage Selector (VSB) (continued)

### 24.9628.0026

PART NO.	QTY	REF DES	DESCRIPTION
62.2098.0337	1 EA	C1	CAP, 330UF, 63V, RAD, ALUMNUM, .300", 20%
63.2001.0001	2 EA	VR1, 2	VARIS, MET. OX, 250V, 100A, RAD
70.3725.0001	8 EA	AP: F1-F4	FUSEHOLDER, PC MT, 2 REQ'D
80.2513.0055	1 EA	Q1	TRANSISTOR, MPSA55 PNP 60V 500MA TO92
82.4302.0004	2 EA	BR1, 2	BRIDGE RECTIFIER, W06G 600V 1.5A
82.4306.4001	1 EA	D3	DIODE, RECTIFIER, 1N4001 50V 1A
82.5302.4148	2 EA	D1, 2	DIODE, ULTRAFAST, 1N4148 100V 10MA
83.3103.0001	1 EA	REG1	IC, LM317T ADJ POS VOLT REGULATOR
83.3117.0001	1 EA	U1	IC, LM393 DUAL COMPARATOR
83.3130.0002	1 EA	REG2	IC, LM309H VOLT REG. +5V



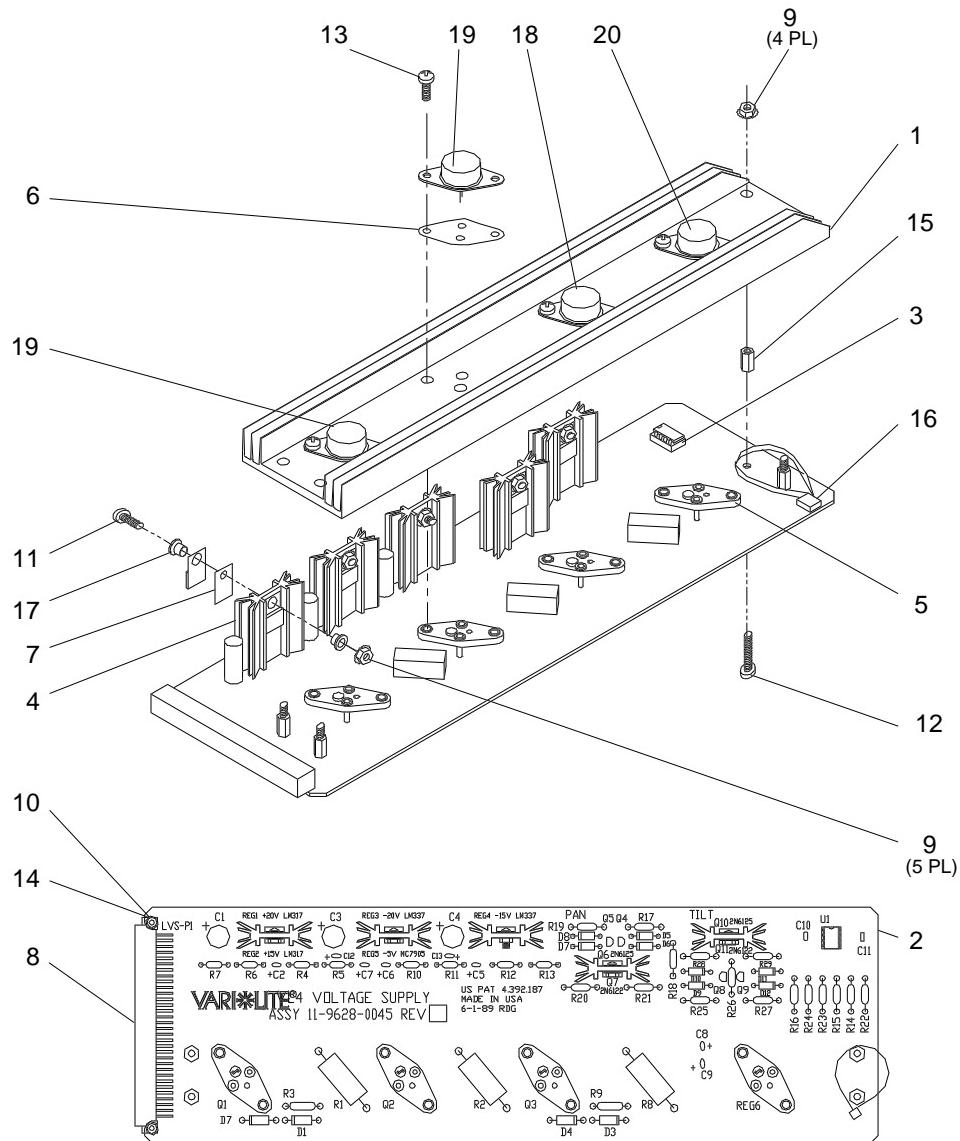
### 4.2.3.10 PCB Assy, VL4 Low Voltage Supply (LVS)

#### 24.9628.0045

NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	10.9628.0074	1 EA		HEATSINK, LOW VOLT SUPPLY
2	11.9628.0046	1 EA		PCB, VL4 LOW VOLTAGE SUPPLY
3	50.2708.0001	1 EA	XU1	SOCKET, 8PIN DIP
4	51.5001.0001	5 EA	AP: REG1.5	HEATSINK, TO-220 1" W/PINS
5	51.5003.0001	4 EA	XQ1.3, XREG6	SOCKET, TO-3 PC/HEATSINK
6	51.5005.0001	4 EA	AP:Q1.3, REG6	INSULATOR, TO-3
7	51.5006.0001	9 EA	AP: REG1.5, Q6, 7, 10, 11	INSULATOR, TO-220
8	52.6246.0002	1 EA	P1	CONN, 64PIN TYPE C RT W/MFBL PIN
9	53.2003.0001	9 EA	AP: REG4, Q6, 7, 10, 11, HEATSINK	NUT, 4-40, KEP ZINC PLATED
10	53.2009.0003	2 EA		NUT, 2-56 NYLON INSERT STOP LOCKING
11	53.6520.0001	5 EA	AP: HEATSINK TO.220 REG1.5, Q6, 7, 10, 11	SCREW, 4-40X3/8"PPZ
12	53.6556.0001	4 EA	HEATSINK	SCREW, 4-40X3/4"PPZ
13	53.6613.0001	8 EA	AP: Q1.3, REG6	SCREW, 6-32X1/2"PPZ
14	53.6659.0004	2 EA		SCREW, 2-56X1/2"PPZ
15	55.2127.0001	4 EA	AP: LVS HEATSINK	STANDOFF, 3/16"HEX 4-40X3/8"
16	55.2188.0001	1 EA		CABLE TIE, BLACK, .18 X 12"
17	55.6509.0001	5 EA	AP: REG1.5	WASHER, SHOULDER (HEATSINK)
18	80.1612.5759	1 EA	Q3	TRANSISTOR, 2N5759 NPN 120V 6A TO3
19	80.1613.6227	2 EA	Q1, 2	TRANSISTOR, MJ15016 PNP 120V 15A TO3
20	83.3107.0001	1 EA	REG6	IC, MPC100 +5V 5A VOLT.REGULATOR
	60.1221.1301	2 EA	R7, 13	RES, 1/4W 1% 1.30K CF
	60.1223.1787	2 EA	R5, 11	RES, 1/4W 1% 1.78K CF
	60.1225.1186	4 EA	R4, 6, 10, 12	RES, 1/4W 1% 118 CF
	60.1424.1005	6 EA	R14.16, 22.24	RES, 1/4W 5% 10K CF
	60.2410.1000	4 EA	R20, 21, 28, 29	RES, 1/2W 5% 1 OHM CC
	60.2423.1007	2 EA	R3, 9	RES, 1/2W 5% 10 OHM
	60.2424.4702	4 EA	R17, 19, 25, 27	RES, 1/2W 5% 470 CF
	60.2431.1001	2 EA	R18, 26	RES, 1/2W 5% 1.0K CF
	60.7440.0015	2 EA	R1, 2	RES, 5W 5% .15 OHM WW
	60.7441.0033	1 EA	R8	RES, 5W 5% .33 WW
	62.2014.0104	2 EA	C10, 11	CAP, .1UF, 50V,RAD,CERAMIC, .100",20%
	62.2017.0105	6 EA	C2, 5.7, 12, 13	CAP, 1.0UF, 50V,RAD,TANTALM, .125",10%
	62.2023.0220	3 EA	C1, 3, 4	CAP, 220UF, 35V,RAD,ALUMNUM, .197",20%
	62.2027.0475	2 EA	C8, 9	CAP, 4.7UF, 35V,RAD,TANTALM, .125",10%
	80.1512.6122	2 EA	Q7, 11	TRANSISTOR, 2N6122 NPN 60V 4A TO220
	80.1513.6125	2 EA	Q6, 10	TRANSISTOR, 2N6125 PNP 60V 4A TO220
	80.2513.0005	2 EA	Q4, 8	TRANSISTOR, MPSA05 NPN 60V 500MA TO92
	80.2513.0055	2 EA	Q5. 9	TRANSISTOR, MPSA55 PNP 60V 500MA TO92

**PCB Assy, VL4 Low Voltage Supply (LVS) (continued)**  
**24.9628.0045**

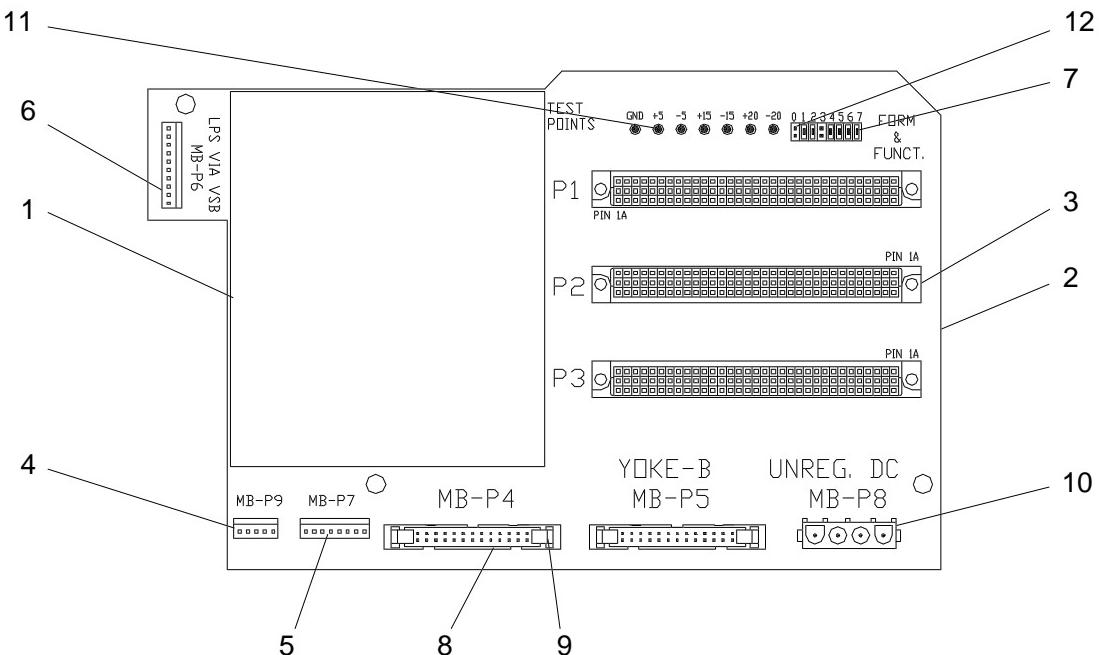
PART NO.	QTY	REF DES	DESCRIPTION
82.4307.4002	8 EA	D5.12	DIODE, RECTIFIER, 1N4002 100V 1A
82.4309.5401	4 EA	D1.4	DIODE, RECTIFIER, 1N5401 100V 3A
83.3103.0001	2 EA	REG1, 2	IC, LM317T ADJ POS VOLT REGULATOR
83.3104.0001	2 EA	REG3, 4	IC, LM337T ADJ NEG VOLT REGULATOR
83.3111.0001	1 EA	U1	IC, 1458 DUAL BIPOOL OP AMP
83.3120.0001	1 EA	REG5	IC, 79M05CT VOLT REG. .5V 500MA



### 4.2.3.11 PCB Assy, Mother (MBD)

#### 24.9628.0053

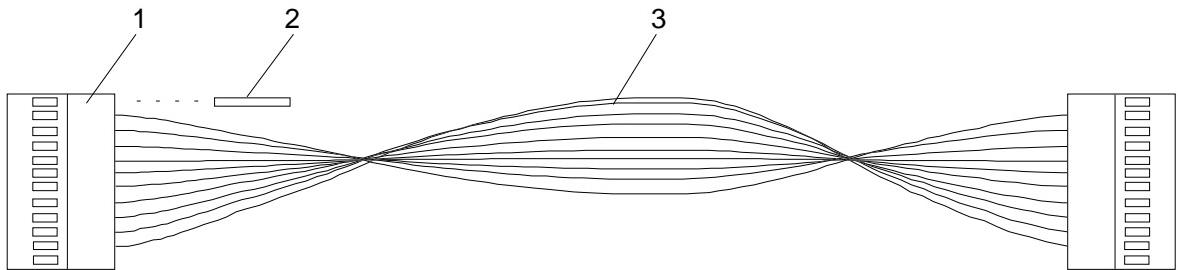
NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0164	1 EA	COVER, FOOT, CHASSIS
2	11.9628.0054	1 EA	PCB, VL4 MOTHER BOARD
3	52.6247.0001	3 EA	CONN, EURO 64POS SCKT TYPE C
4	52.6259.0001	1 EA	HEADER, MTA FRCT LOK STRT POST 5PIN
5	52.6296.0001	1 EA	HEADER, MTA FRCT LOK STRT POST 8PIN
6	52.6357.0001	1 EA	HEADER, MTA FRCT LOK STRT POST 10PIN
7	52.6399.0001	8 EA	JUMPER, PROGRAMMING
8	52.6420.0026	2 EA	PIN HEADER ASSY, WO/LATCH 26POS
9	52.6421.0027	4 EA	PIN HEADER ASSY, LATCH WO/PUSH TABS
10	52.6425.0004	1 EA	PIN HEADER ASSY, MNLOK INLINE 4CIR
11	52.8283.0005	7 EA	TERM, SWAGE TURRET
12	52.8284.0003	1 EA	TERM STRIP, 8PINS STRGHT .025SQ



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**4.2.3.12 Cable Assy, MB-VSB (LK 1) VL4  
25.9628.0152**

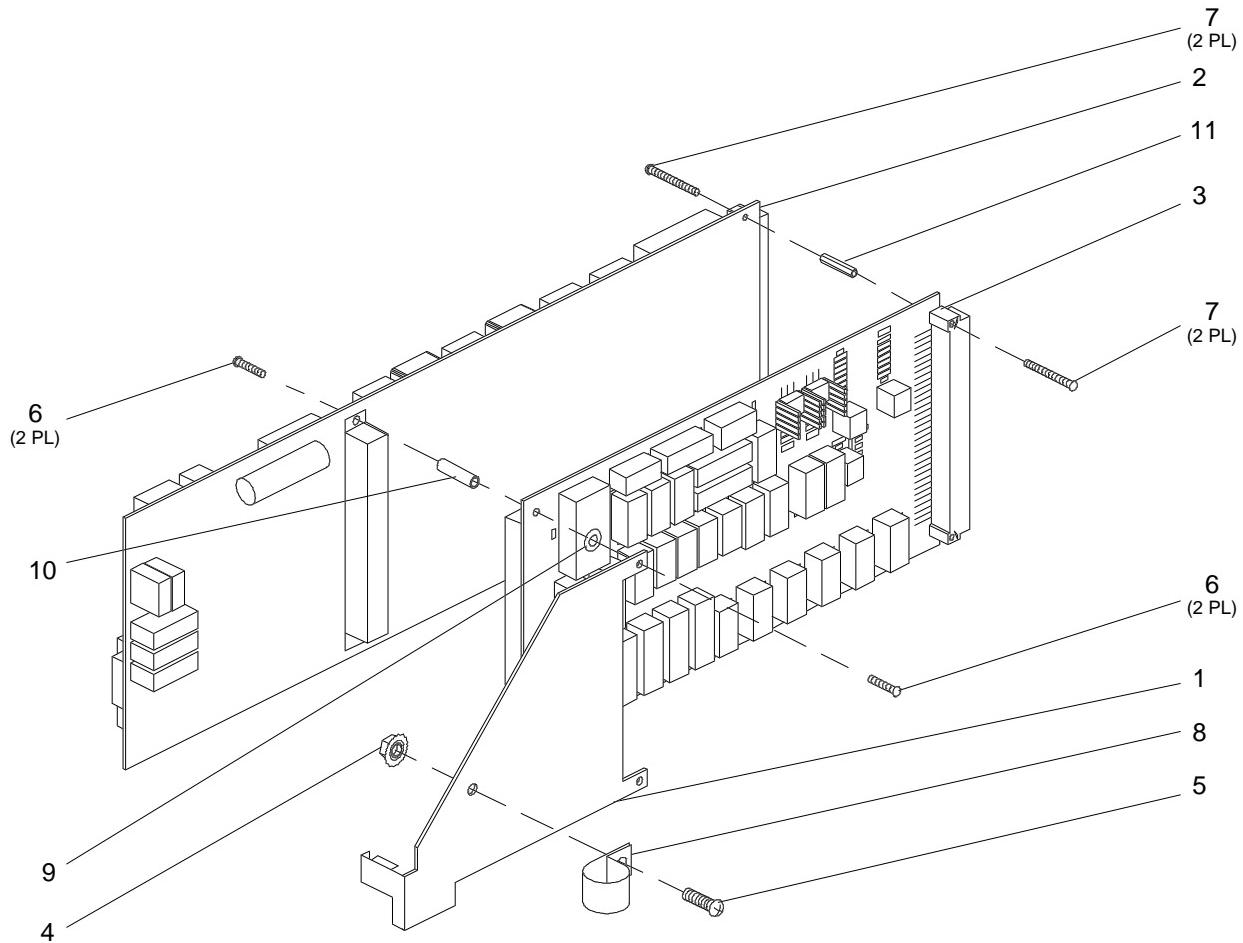
NO.	PART NO.	QTY	DESCRIPTION
1	52.6372.0012	2 EA	CONN HOUSING, MTA CLOSED END RED 12POS
2	52.8291.0001	4 EA	KEYING PLUG, MTA
3	73.7080.0001	8 IN	CBL, 22AWG 10COND TWSTD/UNJCKT



### 4.2.3.13 Elec. Assy, VL4 Lamp Control (UCB/IFB)

#### 23.9628.0232

NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0190	1 EA	BRACKET, HANDLE, UCB
2	24.9628.0073	1 EA	PCB ASSY, VL4 UNIVERSAL CONTROL (UCB)
3	24.9628.0082	1 EA	PCB ASSY, VL4 INTERFACE (IFB)
4	53.2004.0001	1 EA	NUT, 8-32, KEP
5	53.6545.0004	1 EA	SCREW, 8-32X3/8"PPZ
6	53.6659.0003	4 EA	SCREW, 2-56X3/8"PPZ
7	53.6659.0004	4 EA	SCREW, 2-56X1/2"PPZ
8	55.2188.0000	1 EA	CLAMP, CABLE, BLK, .75DIA X .50WIDE
9	55.6677.0002	2 EA	WASHER, .360OD X .123ID X .025THK, NYLON
10	55.6694.0001	2 EA	STANDOFF, 5/32"RND 2.56X7/16
11	55.6694.0002	2 EA	STANDOFF, 5/32"HEX 2.56X21/32



### 4.2.3.14 PCB Assy, VL4 Universal Control (UCB)

#### 24.9628.0073

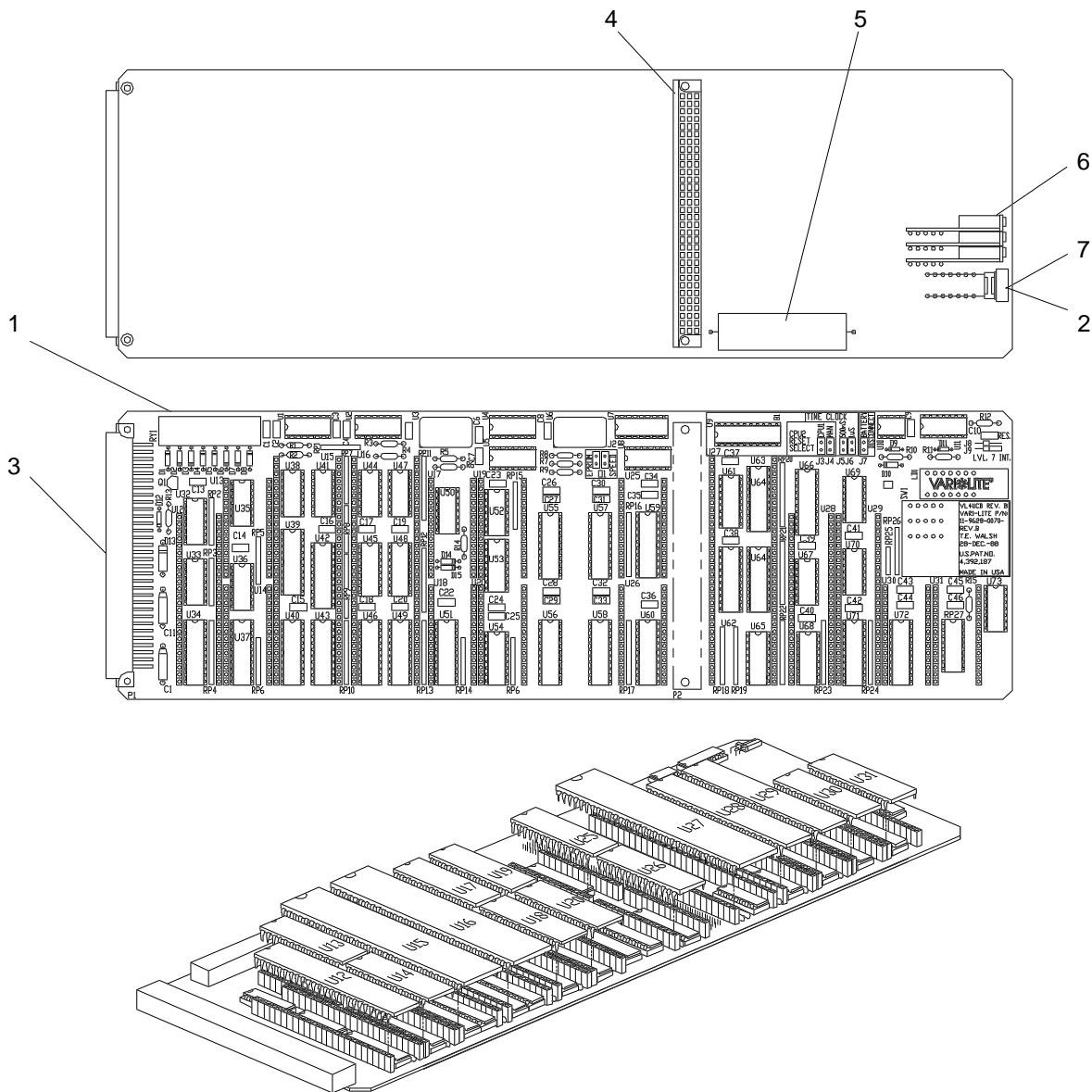
NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	11.9628.0070	1 EA		PCB, UNIVERSAL CONTROL BOARD (UCB)
2	50.2714.0003	1 EA	XLD1	SOCKET, 14PIN RT ANGLE 90DEG
3	52.6246.0002	1 EA	P1	CONN, 64PIN TYPE C RT W/MFBL PIN
4	52.6422.0096	1 EA	P2	CONN, EURO 96POS TYPE C FMLE STRGHT
5	65.5001.0001	1 EA	B1	BATTERY, 3.6V LITHIUM SZ AA
6	74.1025.0001	3 EA	SW1A, 1B, 1C	SWITCH, SUBMINI P.WHL RT ANGLE
7	88.8115.0001	1 EA	LD1	DISP, LED, COMMON ANODE LFT HAND DECI.
	50.2704.0001	2 EA	XU3. 6	SOCKET, XTAL OSC, PC MT W/4 CONTACTS
	50.2708.0001	1 EA	XU10	SOCKET, 8PIN DIP
	50.2714.0001	18 EA	XU1, 2, 4, 8, 11, 32, 35, 36, 38, 41, 44, 47, 50, 52, 67, 69, 70, 73	SOCKET, 14PIN DIP
	50.2716.0001	11 EA	XU5., 7, 33, 45, 48, 53, 54, 61, 65, 68, XRP27	SOCKET, 16PIN DIP
	50.2720.0001	22 EA	XU9, 34, 37, 39, 40, 42, 43, 46, 49, 51, 55.60, 62.64, 66, 71, 72	SOCKET, 20PIN DIP
	52.6419.0014	20 EA	XU13, 14, 17.20, 25, 26, 30, 31	SOCKET STRIP, 14POS ELEVATED
	52.6419.0024	6 EA	XU12, 28, 29	SOCKET STRIP, 24POS ELEVATED
	52.6419.0032	6 EA	XU15, 16, 27	SOCKET STRIP, 32POS ELEVATED
	52.8284.0001	7 EA	J1.7	TERM STRIP, 2.PIN STRAIGHT GOLD CONTACT
	52.8284.0002	2 EA	J8, 9	TERM STRIP, DBL ROW RT ANGLE
	52.8285.0001	5 EA	J1, 3, 6, 7, 9	CONTACT, GOLD MICROSHUNT .260 HEIGHT
	53.6659.0003	4 EA		SCREW, 2-56X3/8"PPZ
	60.1421.2701	1 EA	R12	RES, 1/4W 5% 2.7M CF
	60.1421.4701	1 EA	R13	RES, 1/4W 5% 4.7K CF
	60.1422.1001	2 EA	R10, 14	RES, 1/4W 5% 1K CF
	60.1423.1004	1 EA	R11	RES, 1/4W 5% 1MEG CF
	60.1424.1005	3 EA	R1, 2, 15	RES, 1/4W 5% 10K CF
	60.1431.1007	7 EA	R3.9	RES, 1/4W 5% 10 OHM
	61.4116.0472	1 EA	RP27	RES DIP, 472 16PIN ISOLATED
	61.4306.0102	1 EA	RP8	RES SIP, 102 6PIN BUSSSED LW PRFLE
	61.4306.0103	5 EA	RP2, 7, 14, 15, 25	RES SIP, 103 6PIN BUSSSED LW PROFILE
	61.4306.0470	1 EA	RP1	RES SIP, 470 6PIN BUSSSED LW PRFLE
	61.4308.0102	4 EA	RP3, 5, 6, 19	RES SIP, 102 8PIN BUSSSED LW PRFLE
	61.4310.0102	1 EA	RP20	RES SIP, 102 10PIN BUSSSED LW PRFLE
	61.4310.0103	13 EA	RP4, 9.13, 16. 17. 21.24, 26	RES SIP, 103 10PIN BUSSSED
	61.4608.0103	1 EA	RP18	RES SIP, 103 8PIN BUSSSED LW PRFLE
	62.2015.0104	42 EA	C1.9, 13.33, 35.46	CAP, .1UF, 50V,SIP,CERAMIC, .100",20%
	62.2033.0476	2 EA	C11, 12	CAP, 47UF, 10V,AXL,TANTALM, .420",10%
	62.2099.0104	2 EA	C10, 34	CAP, .1UF, 50V,SIP,CERAMIC, .100",10%
	64.4011.0002	1 EA	U3	CRYSTAL OSCILLATOR, 25MHZ
	64.4012.0001	1 EA	U6	CRYSTAL OSCILLATOR, 32MHZ
	66.4503.0001	1 EA	RY1	RELAY, 4PDT, 2A, 5VDC, PC. MNT, SEALED

**PCB Assy, VL4 Universal Control (UCB) (continued)**  
**24.9628.0073**

PART NO.	QTY	REF DES	DESCRIPTION
80.2513.0005	1 EA	Q1	TRANSISTOR, MPSA05 NPN 60V 500MA TO92
82.4306.4001	1 EA	D12	DIODE, RECTIFIER, 1N4001 50V 1A
82.4310.5817	1 EA	D10	DIODE, RECTIFIER, 1N5817 20V 1A
82.4312.0105	8 EA	D1.8	DIODE, FAST, MUR105/110 50V 1A
82.5301.5908	1 EA	D13	DIODE, ZENER TS , 1N5908 5V 5W
82.5302.4148	1 EA	D9	DIODE, ULTRAFAST, 1N4148 100V 10MA
82.5315.2835	3 EA	D11, 14, 15	DIODE, SCHOTTKY , 5082.2835 8V 10MA
84.0068.0012	2 EA	U16, 27	IC, MC68HC000P12 MICROPROCESSOR (HCMOS)
84.4105.0001	1 EA	U37	IC, HD.6409.9 MANCHESTER ENCODER
84.4107.0002	6 EA	U17.20, 30, 31	IC, UPD43256C.10L 32KX8 STAT RAM
84.4109.0002	2 EA	U13, 14	IC, HD63B40P PROG.TIMER MODULE (CMOS)
84.4118.0001	1 EA	U15	IC, MC68440P.8 DUAL DIR.MEM.ACCESS CTRLR
84.4129.0001	2 EA	U46, 62	IC, 74F521 8.BIT MAGNITUDE COMPARATOR
84.4130.0001	1 EA	U36	IC, 74HC04 HEX INVERTER
84.4131.0001	2 EA	U41, 67	IC, 74HC05 HEX INVERTER W/OPENCOLLECTOR
84.4132.0001	1 EA	U35	IC, 74HC08 QUAD 2.INPUT AND GATE
84.4133.0001	1 EA	U54	IC, 74HC138 3.TO.8 DECODER
84.4134.0001	2 EA	U8, 11	IC, 74HC14 HEX INV. SCHMIDT TRIGGER
84.4137.0001	1 EA	U50	IC, 74HC164 8.BIT SHIFT REG.SER.IN/P.OUT
84.4139.0001	2 EA	U45, 61	IC, 74HC191 UP/DOWN COUNTER
84.4140.0001	6 EA	U9, 34, 55, 57, 58, 71	IC, 74HC244 OCTAL TRISTATE BUFFER
84.4141.0001	1 EA	U72	IC, 74HC273 OCTAL D FLIP FLOP
84.4143.0001	1 EA	U7	IC, 74HC4040 12.STAGE BINARY COUNTER
84.4145.0001	2 EA	U38, 69	IC, 74HC74 DUAL D FLIP FLOP
84.4148.0001	1 EA	U65	IC, 74LS148N 8.TO.3 PRIORITY ENCODER
84.4199.0001	2 EA	U59, 60	IC, 74HC245 OCTAL BUS XCVR W/3.ST.OUTPUT
84.4200.0001	2 EA	U32, 70	IC, 74HC125 QUAD BUFFER 3.STATE
84.7407.0157	2 EA	U53, 68	IC, 74HC157 QUAD 2.TO.1 MULTIPLEXER
84.7407.0174	1 EA	U33	IC, 74HC174 HEX D.FF W/CLR
84.7407.0573	2 EA	U42, 43	IC, 74HC573 DIG CMOS OCT XSPARENT (VL4)
84.7408.0004	1 EA	U44	IC, 74AC04 HEX INVERTER
84.7408.0032	2 EA	U52, 73	IC, 74AC32 QUAD 2.INPUT OR GATE
84.7408.0074	1 EA	U4	IC, 74AC74 DUAL D FLIP FLOP
84.7408.0163	1 EA	U5	IC, 74AC163 4BIT BIN COUNT SYNC RESET
84.7408.0164	1 EA	U47	IC, 74AC164 8.BIT SHIFT REGISTER
84.7408.0251	1 EA	U48	IC, 74AC251, DIGITAL MULTIPLXR
84.8201.0901	2 EA	U28, 29	IC, MK68901N.5 MFP (VL4)
85.5105.0001	1 EA	U1	IC, 75107B DUAL LINE RECEIVER
85.5106.0001	1 EA	U2	IC, 75112 DUAL LINE DRIVER
85.5114.1210	1 EA	U10	IC, DS1210 NON.VOLATILE CONTROLLER

**PCB Assy, VL4 Universal Control (UCB) (continued)  
24.9628.0073**

PART NO.	QTY	REF DES	DESCRIPTION
87.7101.0002	2 EA	U25, 26	IC, 27C256.2 32KX8 U/V EPROM
87.7111.0001	1 EA	U12	IC, R68561AP MULTI.PROTOCOL COMM.CTRLR
87.7129.0002	1 EA	U39	IC, LOGIC, PGM:VL4UCB/B U39
87.7129.0003	1 EA	U40	IC, LOGIC, PGM:VL4UCB/B U40
87.7129.0004	1 EA	U49	IC, LOGIC, PGM:VL4UCB/B U49
87.7129.0005	1 EA	U51	IC, LOGIC, PGM:VL4UCB/B U51
87.7129.0006	1 EA	U56	IC, LOGIC, PGM:VL4UCB/B U56
87.7129.0007	1 EA	U63	IC, LOGIC, PGM:VL4UCB/B U63
87.7129.0008	1 EA	U64	IC, LOGIC, PGM:VL4UCB/B U64
87.7129.0009	1 EA	U66	IC, LOGIC, PGM:VL4UCB/B U66



### 4.2.3.15 PCB Assy, VL4 Interface (IFB)

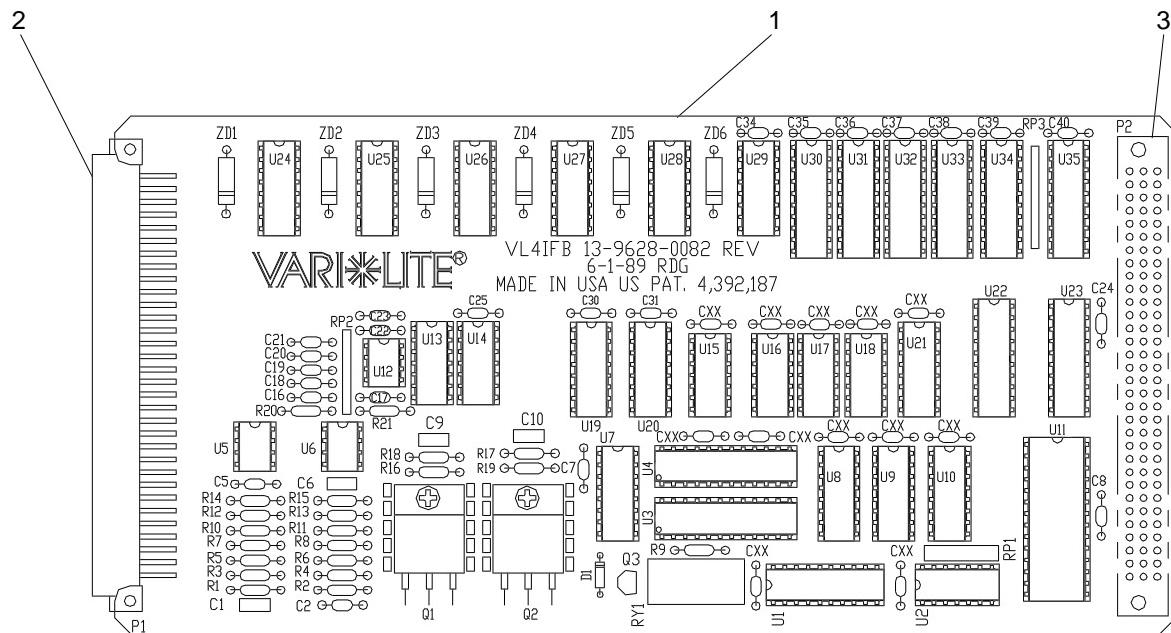
#### 24.9628.0082

NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	11.9628.0083	1 EA		PCB, VL4 INTERFACE
2	52.6246.0002	1 EA	P1	CONN, 64PIN TYPE C RT W/MFBL PIN
3	52.6423.0096	1 EA	P2	CONN, EURO 96POS TYPE R
	50.2708.0001	3 EA	XU5, 6, 12	SOCKET, 8PIN DIP
	50.2714.0001	7 EA	XU2, 13.18	SOCKET, 14PIN DIP
	50.2716.0001	7 EA	XU7.10, 19.21	SOCKET, 16PIN DIP
	50.2720.0001	9 EA	XU1, 22, 23, 30.35	SOCKET, 20PIN DIP
	50.2724.0002	2 EA	XU3, 4	SOCKET, 24PIN DIP .3" CENTERS
	50.2728.0001	1 EA	XU11	SOCKET, 28PIN DIP
	51.5012.0001	2 EA	AP: Q1, 2	HEATSINK, TO.220 0.50" TALL (VL4)
	51.5012.0002	2 EA	AP: Q1, 2	INSULATOR, TO.220, NARROW, MICA
	52.6373.0003	12 EA	AP: AU24.29	SOCKET STRIP, SNGL ROW 8PIN
	53.2003.0001	2 EA	AP: Q1, 2	NUT, 4-40, KEP ZINC PLATED
	53.6520.0001	2 EA	AP: Q1, 2	SCREW, 4-40X3/8"PPZ
	53.6545.0004	3 EA		SCREW, 8-32X3/8"PPZ
	55.6509.0001	2 EA	AP: Q1, 2	WASHER, SHOULDER (HEATSINK)
	60.1222.1504	4 EA	R7, 8, 10, 11	RES, 1/4W 1% 15K CF
	60.1224.1002	8 EA	R1, 2, 12.15, 20, 21	RES, 1/4W 1% 10.0K CF
	60.1227.4993	2 EA	R5, 6	RES, 1/4W 1% 4.99K
	60.1421.4701	5 EA	R9, 16.19	RES, 1/4W 5% 4.7K CF
	60.1429.3305	2 EA	R3, 4	RES, 1/4W 5% 330K CF
	61.4306.0102	1 EA	RP1	RES SIP, 1026PIN BUSSSED LW PRFLE
	61.4308.0272	1 EA	RP2	RES SIP, 272 8PIN BUSSSED LW PRFLE
	61.4310.0102	1 EA	RP3	RES SIP, 102 10PIN BUSSSED LW PRFLE
	62.2013.0104	35 EA	C2.5, 7, 8, 11.32, 34.40	CAP, .1UF, 50V, AXL, CERAMIC, .100", 20%
	62.2015.0474	2 EA	C1, 6	CAP, .47UF, 50V, SIP, CERAMIC, .100", 20%
	62.2099.0103	2 EA	C9, 10	CAP, .01UF, 50V, SIP, CERAMIC, .100", 10%
	66.4501.0001	1 EA	RY1	RELAY, DPDT, 2A, 5VDC, PC. MNT, SEALED
	80.1512.0112	2 EA	Q1, 2	TRANSISTOR, TIP112 NPN 100V 2A TO220
	80.2513.0005	1 EA	Q3	TRANSISTOR, MPSA05 NPN60V500MA TO92
	82.4306.4001	1 EA	D1	DIODE, RECTIFIER, 1N400150V 1A
	82.5311.5357	6 EA	ZD1.6	DIODE, ZENER, 1N5357A/B 20V5W
	83.3102.0001	2 EA	U5, 6	IC, LF442 DUAL JFET OP AMP
	83.3105.0001	1 EA	U13	IC, LM339 COMPARATOR
	83.3117.0001	1 EA	U12	IC, LM393 DUAL COMPARATOR
	83.3154.0558	1 EA	U8	IC, AD558 ANALOG.DIGITAL CONVERTER
	84.4109.0002	1 EA	U11	IC, HD63B40P PROG.TIMER MODULE (CMOS)
	84.4130.0001	1 EA	U16	IC, 74HC04 HEX INVERTER
	84.4131.0001	1 EA	U17	IC, 74HC05 HEX INVERTER W/OPEN COLLECTOR
	84.4132.0001	1 EA	U15	IC, 74HC08 QUAD 2.INPUT AND GATE
	84.4133.0001	1 EA	U21	IC, 74HC1383.T0.8 DECODER
	84.4134.0001	1 EA	U2	IC, 74HC14 HEX INV. SCHMIDT TRIGGER
	84.4138.0001	1 EA	U7	IC, 74HC175 QUAD D FLIP FLOP

## PCB Assy, VL4 Interface (IFB) (continued)

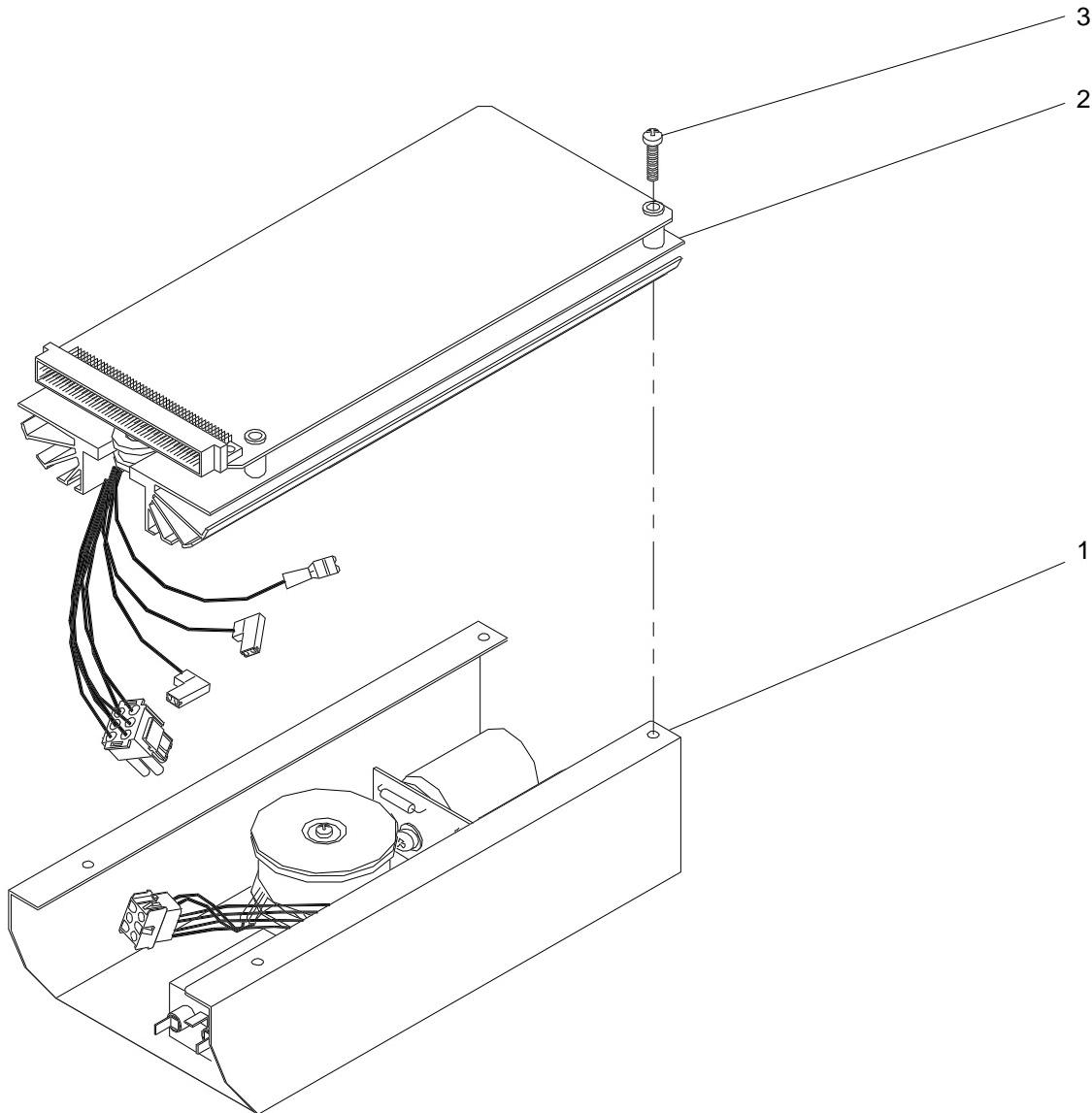
### 24.9628.0082

PART NO.	QTY	REF DES	DESCRIPTION
84.4140.0001	1 EA	U34	IC, 74HC244 OCTAL TRISTATE BUFFER
84.4141.0001	5 EA	U1, 30.33	IC, 74HC273 OCTAL D FLIP FLOP
84.4143.0001	1 EA	U20	IC, 74HC4040 12-STAGE BINARY COUNTER
84.4199.0001	2 EA	U22, 35	IC, 74HC245 OCTAL BUS XCVR W/3-ST.OUTPUT
84.4227.0767	2 EA	U3, 4	IC, AD767 ANALOG TO DIG CONVERTER
84.7407.0010	1 EA	U18	IC, 74HC10 TRIPLE3.IN NAND GATE
84.7407.4017	1 EA	U19	IC, 74HC4017 DECADE COUNTER/DIVIDER
84.7407.4078	1 EA	U14	IC, 74HC4078 8.IN NOR (CMOS)
85.5104.0001	2 EA	U9, 10	IC, HCTL.2000 QUADRATURE DECDR/ COUNTER
85.5107.0001	6 EA	U24.29	IC, 75436 QUAD PERIPHERAL DRIVER
87.7129.0010	1 EA	U23	IC, LOGIC, PGM:VL4IFB U23



**4.2.3.16 Assy, Arc Power Supply +400Watt (APS+)  
21.9628.0020**

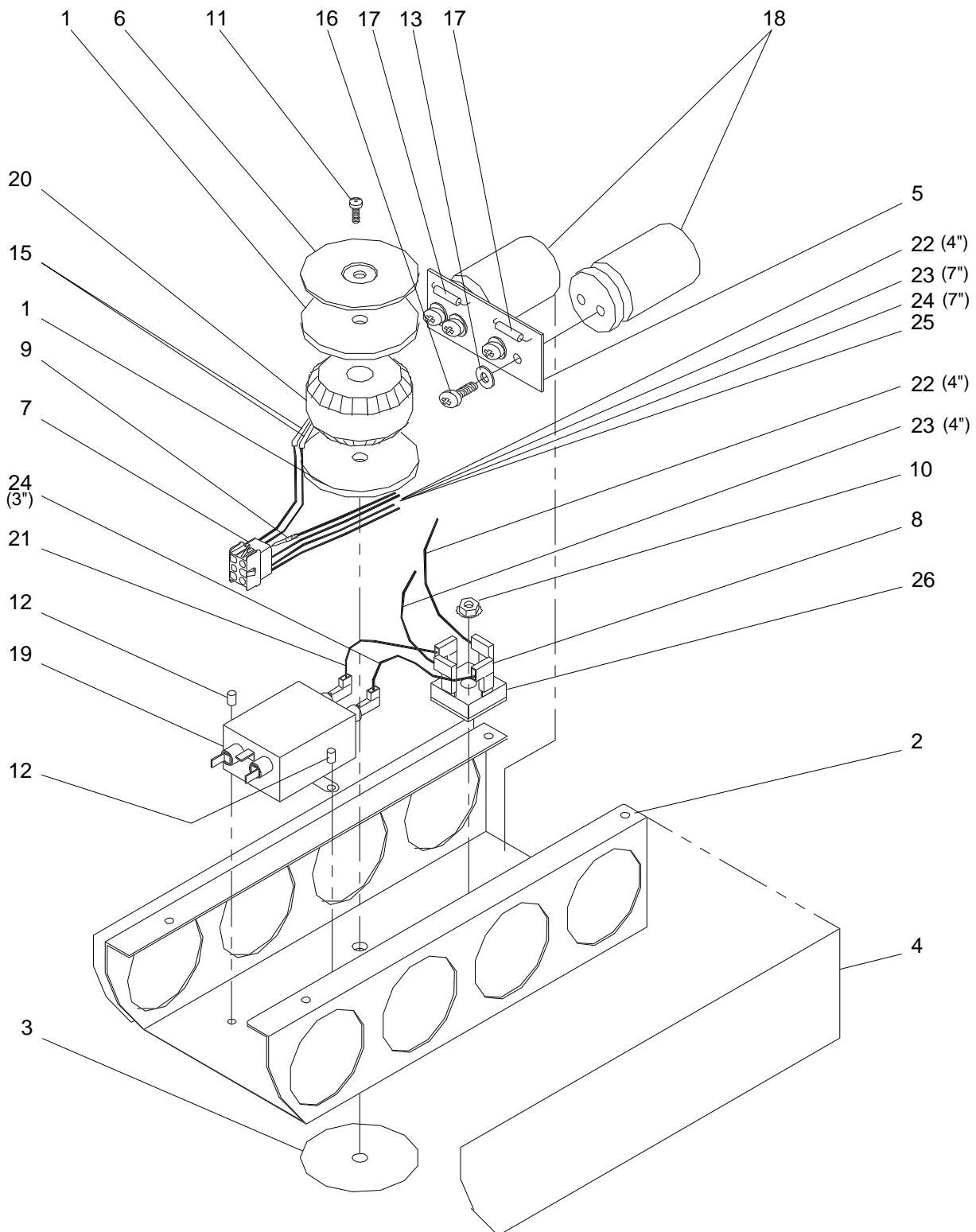
NO.	PART NO.	QTY	DESCRIPTION
1	23.9628.0029	1 EA	ASSY, APS+ CHASSIS (VL4)
2	23.9628.0031	1 EA	ASSY, APS+ HEATSINK (VL4)
3	53.6616.0001	4 EA	SCREW, 6-32X3/4"PPZ



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**4.2.3.17 Assy, APS+ Chassis (VL4)**  
**23.9628.0029**

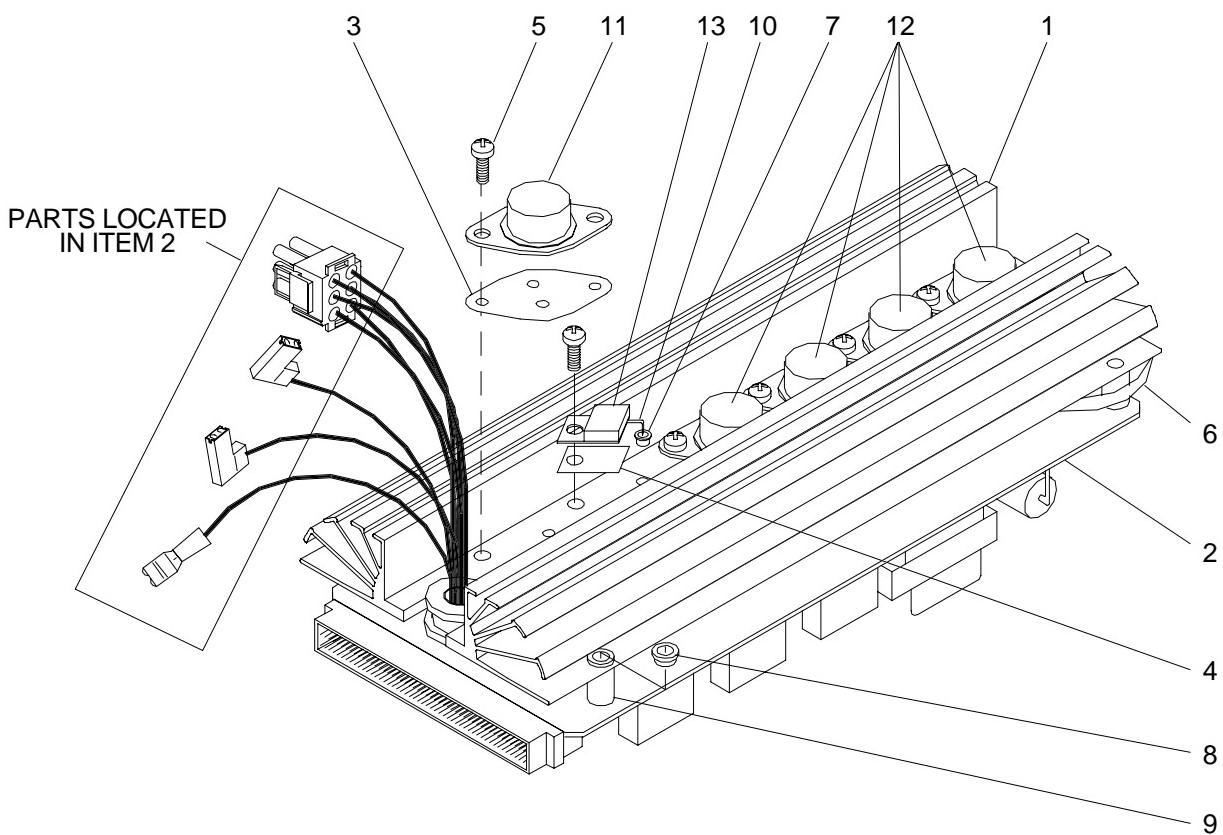
NO.	PART NO.	QTY	DESCRIPTION
1	10.9620.0157	2 EA	PAD, CHOKE, APS
2	10.9628.0030	1 EA	CHASSIS, APS+
3	10.9628.0206	1 EA	PAD, INSULATOR, APS+
4	10.9628.0229	2 EA	INSULATOR, CHASSIS SIDE, APS+
5	11.9620.0163	1 EA	PCB, CAPACITOR TERMINATION
6	46.6003.0001	1 EA	MOUNTING DISC, METAL 60MM DIA
7	52.6375.0001	1 EA	CAP HOUSING, MNLOK 6POS
8	52.8244.0002	6 EA	FASTON RECEPT FLAG,.250 16-14AWG (LOOSE)
9	52.8258.0001	6 EA	CONTACT PIN, 20-14AWG MNLOK (LOOSE)
10	53.2002.0001	1 EA	NUT, 6-32 KEP ZINC PLATED
11	53.6558.0001	1 EA	SCREW, 6-32X3/8"PPZ
12	53.6569.0003	2 EA	RIVET, ALUM COUNTERSINK 3/16"X1/2"
13	55.2114.0001	4 EA	WASHER, LCK INT TTH #10
14	55.2186.0001	8 EA	CABLE TIE, SMALL .10X4" (Not Shown)
15	55.2197.0001	1 IN	HEAT SHRINK 3/8" BLACK (Not Shown)
16	55.6564.0001	4 EA	SCREW, 10-32X5/16"PPZ
17	60.4430.4702	2 EA	RES, 2W 5% 47K MF
18	62.2028.0471	2 EA	CAP, 470UF, 200V,RAD,ALUMNUM, .500",REF
19	67.4001.0001	1 EA	FILTER, EMI 250V 10A (CORCOM 10K1)
20	68.4516.0001	1 EA	CHOKE, TOROID 110 TURNS
21	73.7006.0001	2 IN	WIRE, 16AWG STRND BLACK
22	73.7010.0001	12 IN	WIRE, 16AWG STRND GRAY
23	73.7012.0001	12 IN	WIRE, 16AWG STRND RED
24	73.7016.0001	12 IN	WIRE, 16AWG STRND WHITE/BLACK STRIPE
25	73.7053.0001	7 IN	WIRE, 16AWG RED/BLACK STRIP
26	82.4303.2506	1 EA	BRIDGE RECTIFIER, MDA2506 600V 25A

**Assy, APS+ Chassis (VL4) (continued)**  
**23.9628.0029**

### 4.2.3.18 Assy, APS+ Heatsink (VL4)

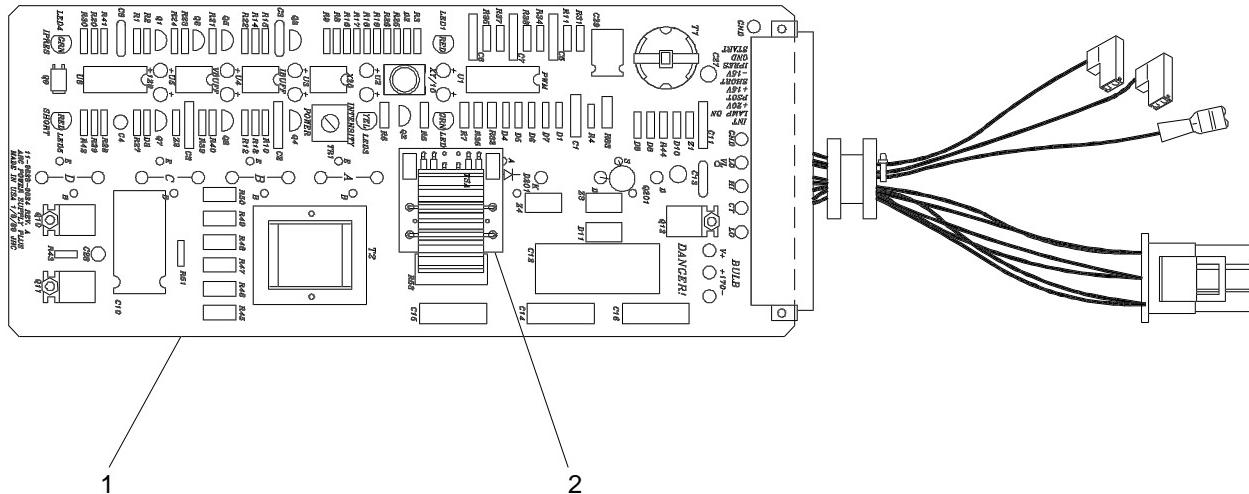
**23.9628.0031**

NO.	PART NO.	QTY	DESCRIPTION
1	10.9628.0032	1 EA	HEATSINK, APS
2	21.9628.0197	1 EA	ASSY, APS+ CNTRL/CURRENT SENSE
3	51.5005.0001	5 EA	INSULATOR, TO-3
4	51.5006.0001	1 EA	INSULATOR, TO-220
5	53.6613.0001	11 EA	SCREW, 6-32X1/2"PPZ
6	55.2188.0001	1 EA	CABLE TIE, BLACK, .18 X 12" (Not Shown)
7	55.6525.0001	1 EA	BUSHING, NYLON SHOULDER, #6X.170DX.125L
8	55.6689.0001	4 EA	INSULATOR, MOLDED NYL SCREW #6 X 1/4"L
9	55.6689.0002	4 EA	SPACER, MOLDED NYL SCREW 8X5/16OD X 3/8L
10	73.7051.0003	1 IN	WIRE, 18AWG BUSS
11	80.1610.0450	1 EA	TRANSISTOR, IRF450 NCH 500V 13A TO3
12	80.1612.1005	4 EA	TRANSISTOR, MJ10005 NPN 400V 20A TO3
13	82.4305.1550	1 EA	DIODE, ULTRAFAST, MUR1550 600V 15A



#### **4.2.3.19 Assy, APS+ Control/Current Sense 21.9628.0197**

<b>NO.</b>	<b>PART NO.</b>	<b>QTY</b>	<b>DESCRIPTION</b>
1	24.9628.0023	1 EA	PCB ASSY, APS+ CONTROL (VL4)
2	24.9628.0197	1 EA	PCB ASSY, APS+ CURRENT SENSE



### 4.2.3.20 PCB Assy, APS+ Control (VL4)

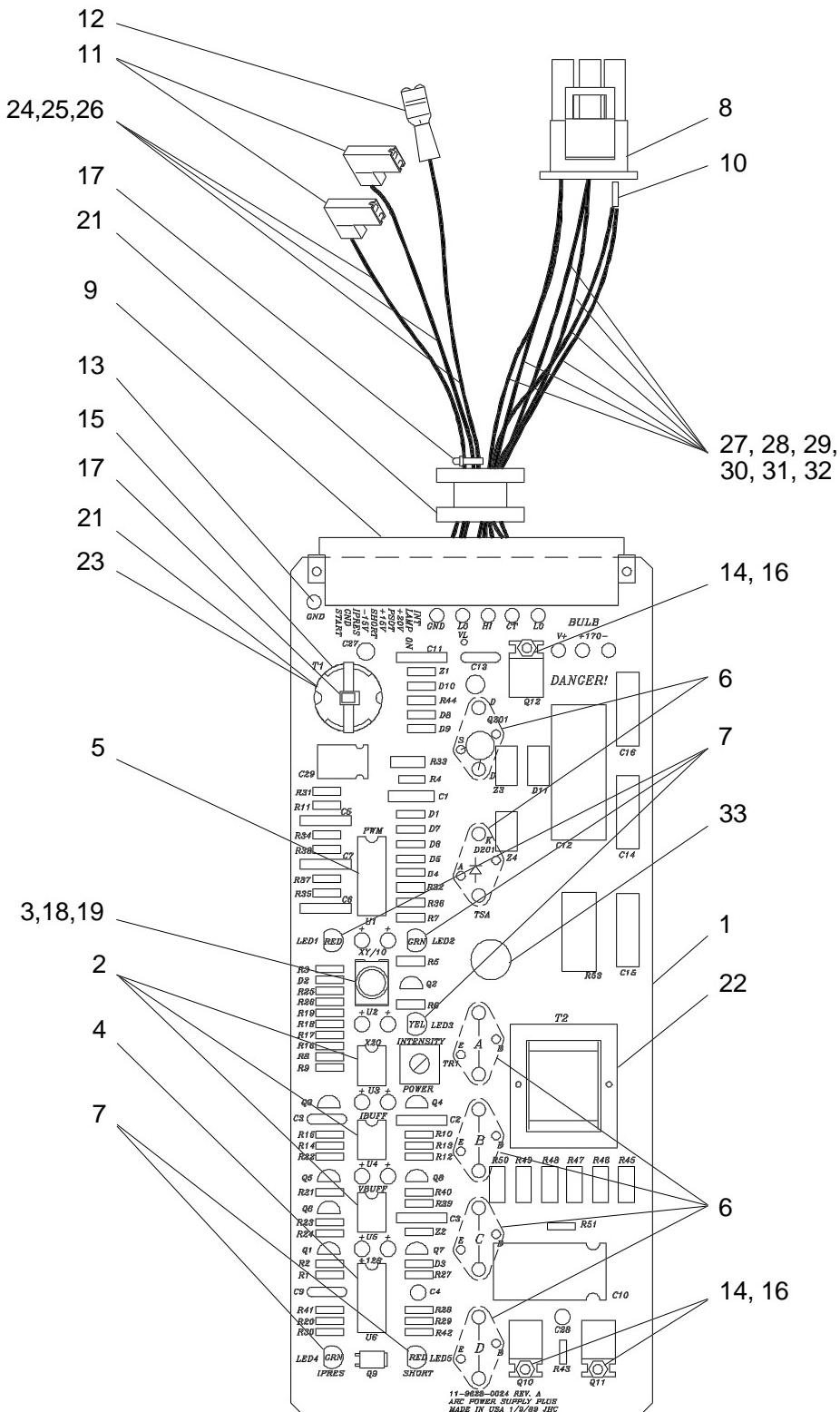
#### 24.9628.0023

NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	11.9628.0024	1 EA		PCB, APS + CONTROL BOARD
2	50.2108.0001	3 EA	XU3, 4, 5	SOCKET, IC PRECI.DIP 8 PIN
3	50.2110.0002	1 EA	XU2	SOCKET, IC PRECI.DIP 10PIN
4	50.2714.0001	1 EA	XU6	SOCKET, 14PIN DIP
5	50.2718.0001	1 EA	XU1	SOCKET, 18PIN DIP
6	51.5003.0001	6 EA	AP: Q201, D201, QA.QD	SOCKET, TO-3 PC/HEATSINK
7	51.5011.0002	5 EA	AP: LED1.5	MOUNTING PAD, LED
8	52.6243.0001	1 EA	P2	CONN PLUG, MNLOK 6POS
9	52.6246.0002	1 EA	P1	CONN, 64PIN TYPE C RT W/MFBL PIN
10	52.8256.0001	6 EA		CONTACT SOCKET, MNLOK TIN
11	52.8244.0002	2 EA	TO L INE FILTER	FASTON RECEPT FLAG,.250 16-14AWG (LOOSE)
12	52.8271.0002	1 EA	CHASSIS GROUND	FASTON RECEPT, 16-14AWG (LOOSE)
13	52.8283.0002	1 EA	TP:GND	TERM, SWAGE MT.TURRET (VL4)
14	53.2003.0001	3 EA	AP: Q10, 11, 12	NUT, 4-40, KEP ZINC PLATED
15	53.6529.0001	1 EA	AP: T1	CLIP, MOUNTING, DRIVE
16	53.6596.0001	3 EA	AP: Q10, 11, 12	SCREW, 4-40X5/16"PPZ
17	55.2186.0001	7 EA		CABLE TIE, SMALL .10X4"
18	55.6609.0003	1 EA	UNDER U2	WASHER, NYLON .375OD .256ID, .032TH
19	55.6690.0001	1 EA	AP: U2	PAD, MNTG. IC/DISCRETE COMPON 10PIN
20	55.9628.0001	1 EA		GROMMET, 3/8"ID X7/8"ODX7/16"THICK
21	68.4507.0001	2 EA	P/O T1	CORE, DRIVE
22	68.4521.0001	1 EA	T2	TRANSFORMER, 400HZ, 1PRI/4SEC
23	68.9628.0023	1 EA	T1	TRANSFORMER, APS+ VL4
24	73.7006.0001	6 IN		WIRE, 16AWG STRND BLACK
25	73.7007.0001	6 IN		WIRE, 16AWG STRND WHITE
26	73.7008.0001	6 IN		WIRE, 16AWG STRND GREEN
27	73.7010.0001	6 IN		WIRE, 16AWG 300V 80C GRY STRND UL1061
28	73.7012.0001	6 IN		WIRE, 16AWG STRND RED
29	73.7013.0001	6 IN		WIRE, 16AWG STRND BLUE
30	73.7016.0001	6 IN		WIRE, 16AWG STRND WHITE/BLACK STRIPE
31	73.7053.0001	6 IN		WIRE, 16AWG RED/BLACK STRIP
32	73.7042.0001	6 IN		WIRE, 16AWG 300V 80C YEL STRND UL1061
33	74.1006.0003	1 EA	TS1	THERMOSTAT, 205 DEGREES (VL4 APS+)
	60.1420.1203	3 EA	R3, 7, 20	RES, 1/4W 5% 1.2K CF
	60.1420.1503	2 EA	R9, 22	RES, 1/4W 5% 1.5K CF
	60.1420.2204	3 EA	R14, 15, 18	RES, 1/4W 5% 2.2K CF
	60.1420.3302	1 EA	R28	RES, 1/4W 5% 33K CF
	60.1420.8203	1 EA	R35	RES, 1/4W 5% 8.2K CF
	60.1421.2202	1 EA	R44	RES, 1/4W 5% 220 OHM CF
	60.1421.4702	1 EA	R31	RES, 1/4W 5% 47K CF
	60.1422.1001	4 EA	R4, 16, 29, 42	RES, 1/4W 5% 1K CF
	60.1422.2202	1 EA	R51	RES, 1/4W 5% 22K CF
	60.1423.1803	1 EA	R19	RES, 1/4W 5% 1.8K CF
	60.1424.1005	17 EA	R1, 2, 5, 6, 8, 10.12, 21, 23.25, 27, 32, 39, 40, 43	RES, 1/4W 5% 10K CF

**PCB Assy, APS+ Control (VL4) (continued)**  
**24.9628.0023**

PART NO.	QTY	REF DES	DESCRIPTION
60.1425.1003	1 EA	R38	RES, 1/4W 5% 100 OHMS CF
60.1425.5603	2 EA	R13, 37	RES, 1/4W 5% 560 OHM CF
60.1426.1003	2 EA	R26, 41	RES, 1/4W 5% 100K CF
60.1426.3904	1 EA	R17	RES, 1/4W 5% 39K CF
60.1429.3303	2 EA	R30, 34	RES, 1/4W 5% 330 CF
60.1431.1007	1 EA	R36	RES, 1/4W 5% 10 OHM
60.3430.0047	4 EA	R45.48	RES, 1W 5% 4.7OHM MET OXIDE
60.3430.1005	2 EA	R49, 50	RES, 1W 5% 100K MET OXIDE
60.3530.1002	1 EA	R33	RES, 1W 5% 100 OHM MF FLAME.PROOF
60.7442.1007	1 EA	R53	RES, 5W 5% 10 OHMS WW
62.2002.0101	2 EA	C3, 9	CAP, 100PF,1000V,RAD,DIPMICA, .234", 5%
62.2005.0001	3 EA	C6, 7, 11	CAP, .01UF, 630V,RAD,POLYEST, .400",10%
62.2012.0104	1 EA	C15	CAP, .1UF, 400V,RAD,POLYEST, .580",10%
62.2016.0104	3 EA	C1, 2, 8	CAP, .1UF, 100V,RAD,POLYEST, .300",10%
62.2027.0475	2 EA	C27, 28	CAP, 4.7UF, 35V,RAD,TANTALM, .125",10%
62.2042.0105	12 EA	C4, 17.26, 31	CAP, 1UF, 35V,RAD,TANTALM, .125",10%
62.2043.0107	1 EA	C29	CAP, 100UF, 25V,AXL,ALUMNUM, .630",20%
62.2047.0001	1 EA	C13	CAP, .001UF,1000V,RAD,CERAMIC, .250",20%
62.2047.0022	1 EA	CDS	CAP,.0022UF,1000V,AXL,CERAMIC, .295", 5%
62.2049.0105	1 EA	C12	CAP, 1UF, 400V,AXL,POLYPRO,1.500",10%
62.2083.0108	1 EA	C10	CAP, 1000UF, 35V,AXL,ALUMNUM,1.240",20%
62.2087.0220	1 EA	C5	CAP, .22UF, 100V,RAD,POLYEST, .400",10%
62.3000.0033	2 EA	C14, 16	CAP, .033UF,1000V,RAD,POLYPRO, .400",10%
63.2012.0001	1 EA	TR1	POT, 10K,LIN, 1TRN, HORIZ MNT, 10%
80.1512.0112	1 EA	Q10	TRANSISTOR, TIP112 NPN 100V 2A TO220
80.1513.0117	2 EA	Q11, 12	TRANSISTOR, TIP117 PNP 100V 2A TO220
80.2512.0113	1 EA	Q9	TRANSISTOR, IRFD113 NCH 60V 800mA DIP4
80.2513.0005	7 EA	Q1.7	TRANSISTOR, MPSA05 NPN 60V 500mA TO92
80.2513.0055	1 EA	Q8	TRANSISTOR, MPSA55 PNP 60V 500mA TO92
82.4304.0856	1 EA	D11	DIODE, FAST, MR856 600V 3A
82.4307.4002	1 EA		DIODE, RECTIFIER, 1N4002 100V 1A
82.4312.0105	3 EA	D8.10	DIODE, FAST, MUR105/110 50V 1A
82.4317.5819	7 EA	D1.7	DIODE, RECTIFIER, 1N5819 40V 1A
82.5301.6303	2 EA	Z3, 4	DIODE, ZENER TS ,1.5KE200 200V 5W
82.5304.4742	2 EA	Z1, 2	DIODE, ZENER ,1N4742 12V 1W
83.3102.0001	1 EA	U3	IC, LF442 DUAL JFET OP AMP
83.3109.0001	1 EA	U6	IC, 14024 SEVEN STAGE RIPPLE COUNTER
83.3149.0002	1 EA	U1	IC, SG3526N PULSE WIDTH MODULATOR
83.3152.0117	2 EA	U4, 5	IC, INA117P, FET INPUT
83.3153.0100	1 EA	U2	IC, MPY100 AM/AD632AH MULT.DIVIDER
88.8101.0001	2 EA	LED1, 5	LED, RED HP
88.8102.0001	1 EA	LED3	LED, YELLOW HP
88.8103.0001	2 EA	LED2, 4	LED, GREEN HP

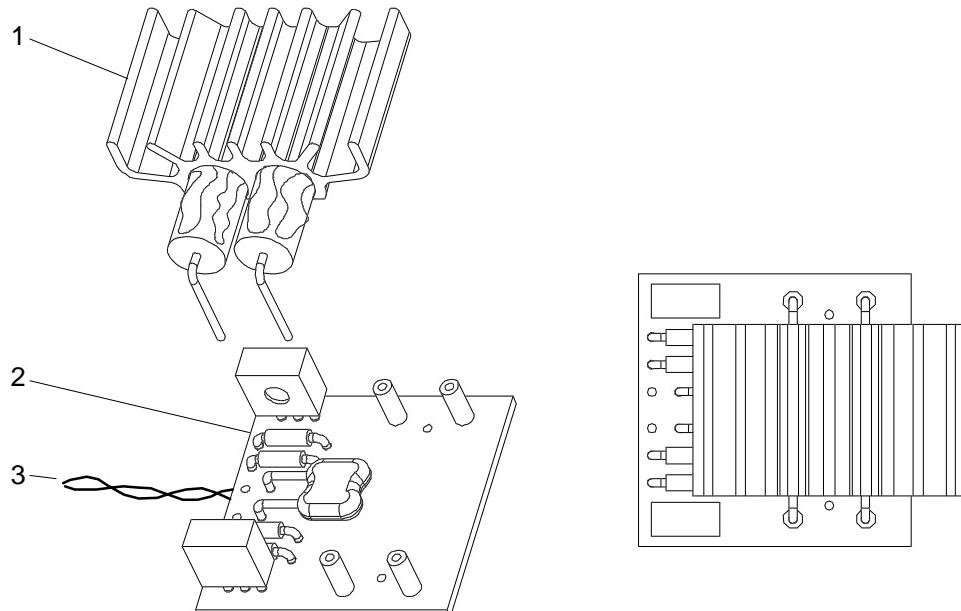
**PCB Assy, APS+ Control (VL4) (continued)**  
**24.9628.0023**



### 4.2.3.21 PCB Assy, APS+ Current Sense

#### 24.9628.0197

NO.	PART NO.	QTY	REF DES	DESCRIPTION
1	10.9628.0241	1 EA		HEAT SINK, CURRENT SENSING RESISTOR VL4
2	11.9628.0198	1 EA		PCB, APS+ CURRENT SENSE
3	73.7088.0001	9 IN		WIRE, 26AWG TW.PR BLU/WHT SOLID,TINNED
	52.6373.0003	1 EA		SOCKET STRIP, SNGL ROW 8PIN
	52.8241.0001	4 EA	AP: R52A, 52B	PIN CONTACT, 16AWG GOLD
	55.2199.0001	1 IN		HEATSHRINK, 1/16" BLACK
	60.1230.2003	4 EA	R54.57	RES, 1/4W 1% 200K MF
	60.7242.0501	2 EA	R52A, 52B	RES, 5W 1% .05 WW
	62.2063.0180	1 EA	C30	CAP, 18PF, 500V,RAD,DIPMICA, .234", 5%
	63.2012.0002	2 EA	TR2, 3	POT, 10K,LIN, 1TRN, VERT MNT, 10%



## Chapter 5. Wiring Diagrams

This chapter contains electrical diagrams, connector pin codes, and schematics for the **VL4** luminaire. Sections are as follows:

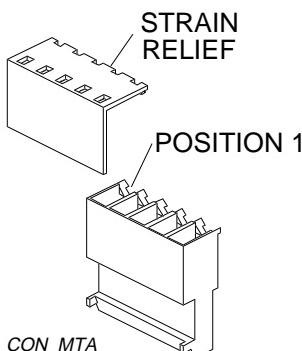
- 5.1 Connector Type Identification
- 5.2 Connector Pin Diagrams
- 5.3 Schematics and Wiring Diagrams

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## 5.1 Connector Type Identification

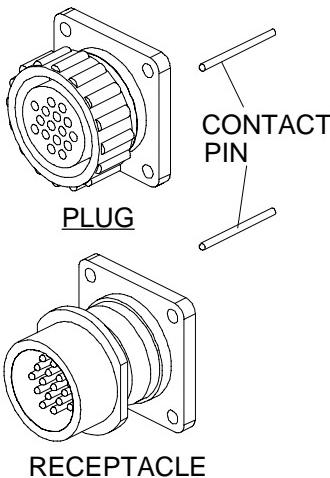
The **VL4** luminaire contains the following connector types:

### 5.1.1 MTA-100 and MTA-156



MTA-100 and MTA-156 connectors are used to connect wires to PC boards. MTA-100 connectors are smaller in size and use smaller diameter wire than MTA-156 connectors. The connectors range from two through ten positions and come in red, yellow and black colors. A strain relief is usually used in conjunction with the connector to protect the wire connection. This illustration shows a typical five position MTA style connector and strain relief.

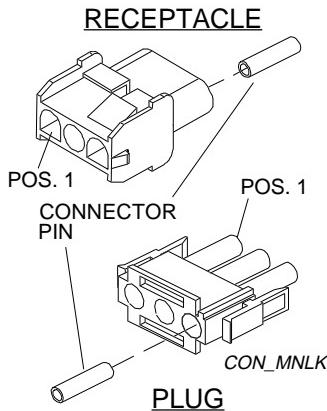
### 5.1.2 CPC



CPC connectors are used to connect luminaire wiring to external cables. The **VL4** luminaire input panel uses one, nine position CPC connector (receptacle type). Contact pins are installed on the wires and the wires and contact pins are inserted into the CPC connector. Refer to the Connector Pin Locations section in this chapter for position identification.

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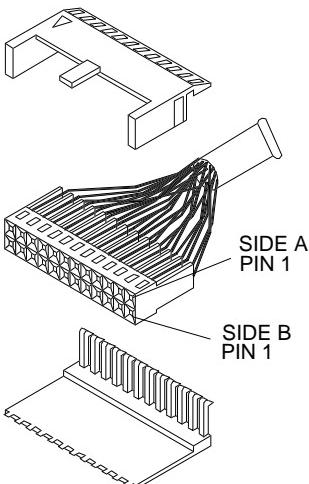
### 5.1.3 Mate-N-Lok



Mate-N-Lok connectors are used to connect internal wire harnesses. Connector pins are installed on the wires and the wires and connector pins are inserted into the Mate-N-Lok plugs or receptacles. Plugs and receptacles may be free (as shown) or PC board mounted. Although a three position connector is shown, the **VL4** luminaire uses three and four position connectors.

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### 5.1.4 MT



MT connectors are used to connect wire cables to PC boards. The black MT connector has 26 positions divided into an A and B side. Wires are installed from each side and protected with two covers. The illustration shows pin one for sides A and B, and covers.

## 5.2 Connector Pin Diagrams

### 5.2.1 Yoke Termination PCB Connections

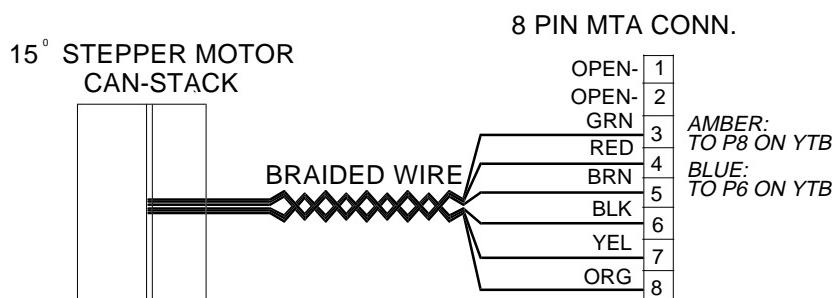
#### 5.2.1.1 Blue/Amber Bulkhead

8-PoS MTA Blue Stepper Motor

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	GRN	22 AWG	+20V
4	RED	22 AWG	+20V
5	BRN	22 AWG	MO1A
6	BLK	22 AWG	MO1B
7	YEL	22 AWG	MO1C
8	ORG	22 AWG	MO1D

8-PoS MTA Amber Stepper Motor

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	GRN	22 AWG	+20V
4	RED	22 AWG	+20V
5	BRN	22 AWG	MO2A
6	BLK	22 AWG	MO2B
7	YEL	22 AWG	MO2C
8	ORG	22 AWG	MO2D



## 4-Pos MTA Blue Contact Switch

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	BLU	22 AWG	+15V
4	BLU	22 AWG	SENS1

## 4-Pos MTA Amber Contact Switch

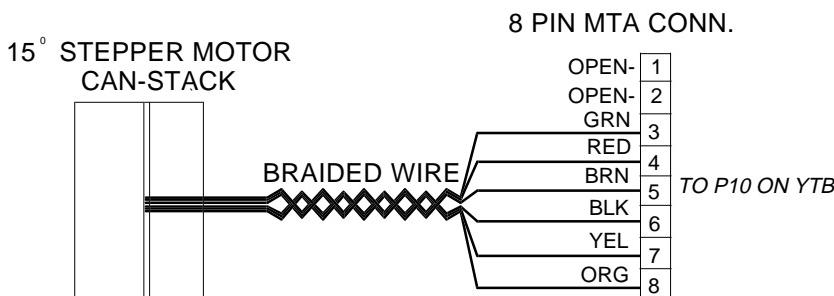
Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	BLU	22 AWG	+15V
4	BLU	22 AWG	SENS2



## 5.2.1.2 Dimmer/Magenta/Douser Bulkhead

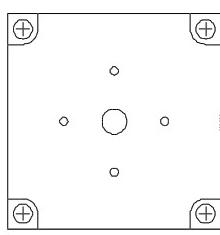
## 8-Pos MTA Magenta Stepper Motor

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	GRN	22 AWG	+20V
4	RED	22 AWG	+20V
5	BRN	22 AWG	MO3A
6	BLK	22 AWG	MO3B
7	YEL	22 AWG	MO3C
8	ORG	22 AWG	MO3D



## 8-PoS MTA Dimmer Stepper Motor

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	WHT	22 AWG	+20V
4	BLK	22 AWG	+20V
5	RED	22 AWG	MO4A
6	YEL	22 AWG	MO4B
7	ORG	22 AWG	MO4C
8	BRN	22 AWG	MO4D

9° STEPPER MOTOR  
48 OHM

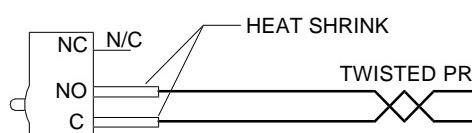
8-POS MTA CONN.

OPEN-	1
OPEN-	2
WHT	3
BLK	4
RED	5
YEL	6
ORG	7
BRN	8

## 4-PoS MTA Magenta Contact Switch

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	BLU	22 AWG	+15V
4	BLU	22 AWG	SENS1

CONTACT SWITCH



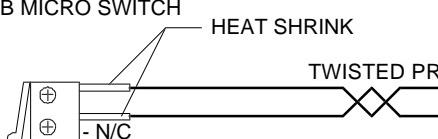
4-POS MTA CONN.

OPEN-	1
OPEN-	2
BLU	3
BLU	4

## 4-PoS MTA Dimmer Sub Micro Switch

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	BLU	22 AWG	+15V
4	BLU	22 AWG	SENS2

SUB MICRO SWITCH



4-POS MTA CONN.

OPEN-	1
OPEN-	2
VIO	3
VIO	4

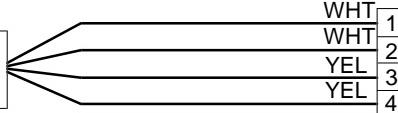
4-Pos MTA Douster Soleniod

Pos.	Wire	Wire Size	Description
1	WHT	22 AWG	GND
2	WHT	22 AWG	GND
3	YEL	22 AWG	DOUSER A
4	YEL	22 AWG	DOUSER B

SOLENOID ASSY



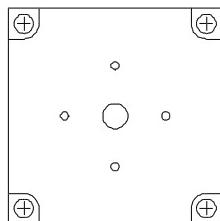
4-POS MTA CONN.

**5.2.1.3 Diffuser Assembly**

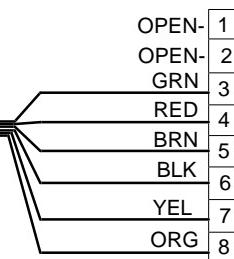
## 8-Pos MTA Diffuser Stepper Motor

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	GRN	22 AWG	+20V
4	RED	22 AWG	+20V
5	BRN	22 AWG	MO5A
6	BLK	22 AWG	MO5B
7	YEL	22 AWG	MO5C
8	ORG	22 AWG	MO5D

7.5° STEPPER MOTOR



8-POS MTA CONN.

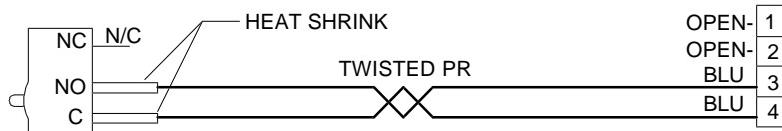


## 4-PoS MTA Diffuser Contact Switch

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	N/C	-	-
3	BLU	22 AWG	+15V
4	BLU	22 AWG	SENS5

CONTACT SWITCH

4-POS MTA CONN.



## 5.2.1.4 Rear Bulkhead and Bulb

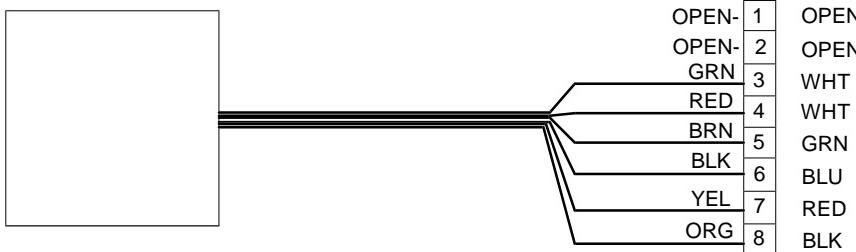
**Note:** The linear actuator motor used in this assembly is manufactured by two different manufacturers. Use the applicable pin-wire code.

## 8-PoS MTA Focus Linear Actuator

Pos.	Wire Version 1	Wire Version 2	Wire Size	Description
1	N/C	N/C	-	-
2	N/C	N/C	-	-
3	WHT (from blue/red group)	GRN	22 AWG	+20V
4	WHT	RED	22 AWG	+20V
5	BLK	BRN	22 AWG	MO6A
6	RED	BLK	22 AWG	MO6B
7	GRN	YEL	22 AWG	MO6C
8	BLU	ORG	22 AWG	MO6D

LINEAR ACTUATOR

ALT. PINOUT



8-POS MTA CONN.

### 5.2.1.5 Tilt Motor Connections

5 & 4-PoS MTA-100's

Pos.	Wire	Wire Size	Description
1	YEL	22 AWG	TILT ENC-B
2	BLK	22 AWG	TILT ENC-A
3	WHT	22 AWG	GND
4	RED	22 AWG	+5V
5	N/C	-	-
1	WHT	22 AWG	TILT TACH-
2	BLU	22 AWG	TILT V+
3	RED	22 AWG	GND
4	BLK	22 AWG	GND



## 5.2.2 VL4 Input Connector Wire Cable (25.9628.0150)

9-Pin CPC Receptacle

Pos.	Wire	Wire Size	Description
1	N/C	-	-
2	RED	22 AWG	BROADCAST +
3	GRN	22 AWG	SIGNAL GND.
4	BLK	22 AWG	BROADCAST -
5	GRY	22 AWG	REPLY -
6	WHT	22 AWG	REPLY +
7	WHT	16 AWG	AC LO
8	GRN	16 AWG	EARTH GND
9	BLK	16 AWG	AC HI

5-Pin MTA Plug

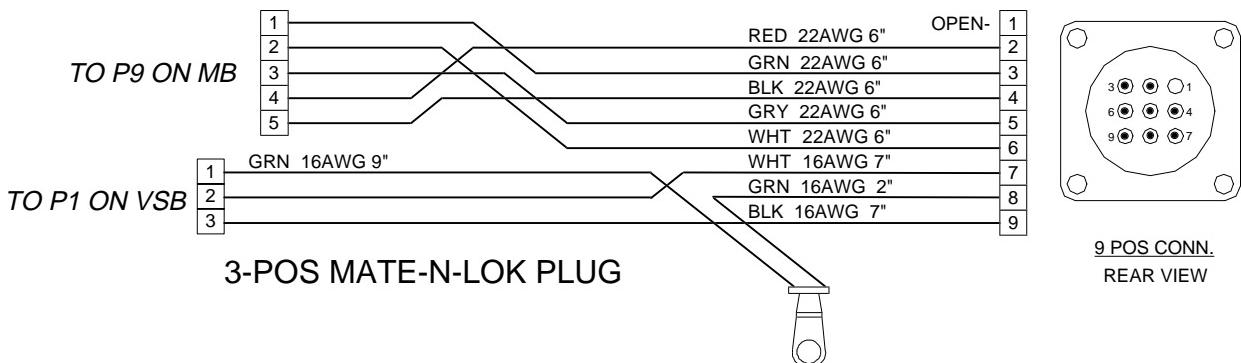
Pos.	Wire	Wire Size	Description
1	GRN	22 AWG	SIGNAL GND.
2	WHT	22 AWG	REPLY +
3	GRY	22 AWG	REPLY -
4	RED	22 AWG	BROADCAST +
5	BLK	22 AWG	BROADCAST -

3-Pin MATE-N-LOK Socket Plug

Pos.	Wire	Wire Size	Description
1	GRN	16 AWG	EARTH GND.
2	WHT	16 AWG	AC LO
3	BLK	16 AWG	AC HI

RED 5-POS MTA-100 PLUG

9-POS CPC RECEPTACLE



### 5.2.3 VL4 Transformer/Capacitor LK3 Cable (25.9628.0156)

1/4 Inch Faston

Term.	Wire	Wire Size	Description
1	ORG	16 AWG	+10V
2	BLU	16 AWG	+30V
3	YEL	16 AWG	-30V
4	GRN	16 AWG	GND

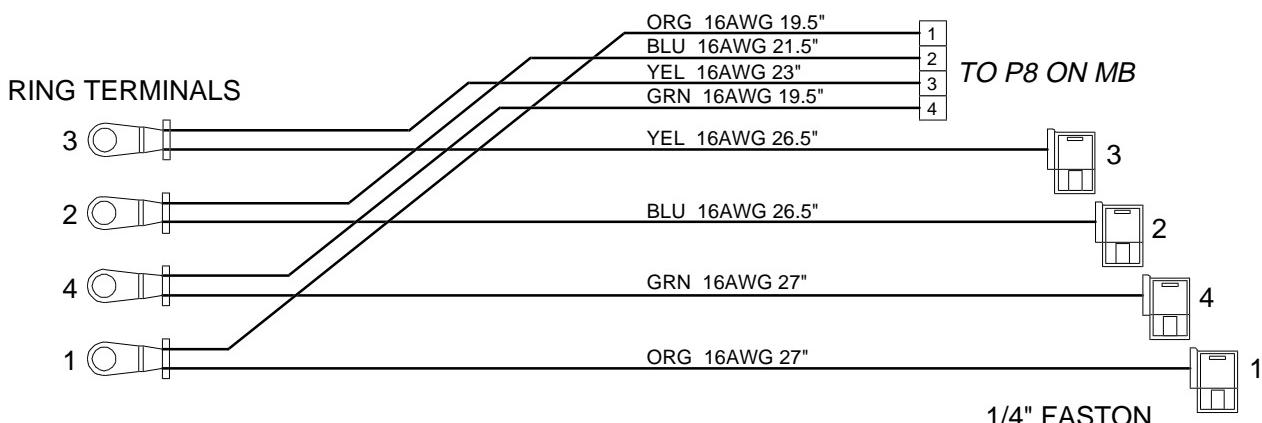
Ring Terminals

Term.	Wire	Wire Size	Description
1	ORG	16 AWG	+10V
2	BLU	16 AWG	+30V
3	YEL	16 AWG	-30V
4	GRN	16 AWG	GND

4-Pos MATE-N-LOK Plug

Pos.	Wire	Wire Size	Description
1	ORG	16 AWG	+10V
2	BLU	16 AWG	+30V
3	YEL	16 AWG	-30V
4	GRN	16 AWG	GND

4-POS MATE-N-LOK PLUG



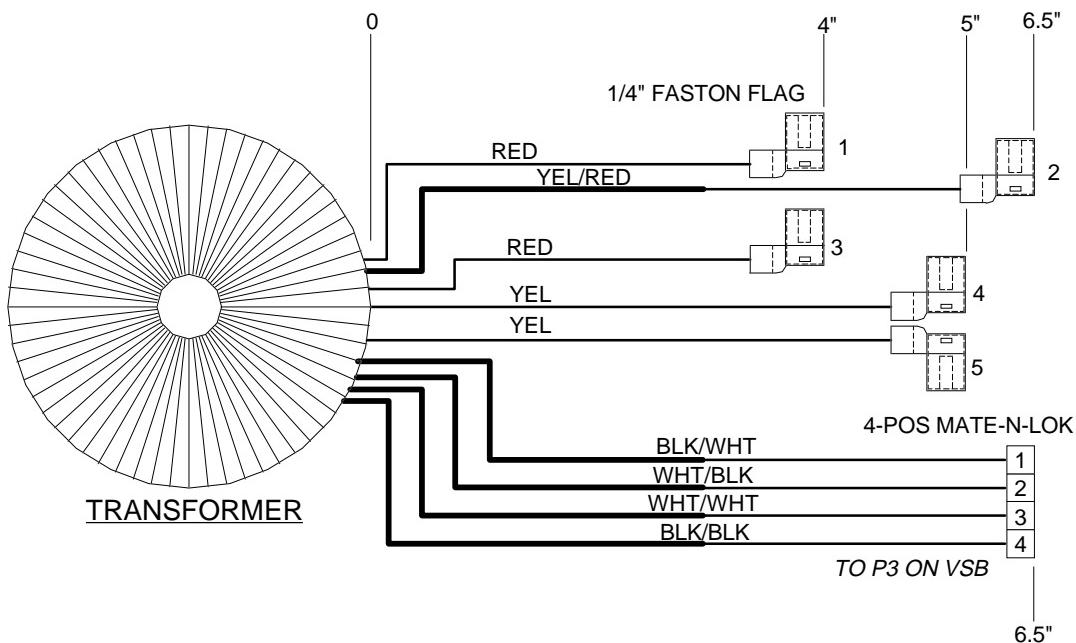
## 5.2.4 VL4 Connectorized Transformer Connections (23.9628.0159)

1/4 Inch Faston

Term.	Wire	Jacket	Wire Size	Description
1	RED	N/A	16 AWG	Y1 (+/-30V)
2	RED	YEL	16 AWG	Y1 (+/-30V)
3	RED	N/A	16 AWG	C.T. GND
4	YEL	N/A	16 AWG	Y1 (+/-30V)
5	YEL	N/A	16 AWG	Y1 (+/-30V)

4-Pos MATE-N-LOK Plug

Pos.	Wire	Jacket	Wire Size	Description
1	WHT	BLK	16 AWG	X2
2	BLK	WHT	16 AWG	X3
3	WHT	WHT	16 AWG	X4 LO
4	BLK	BLK	16 AWG	X1 HI



## 5.2.5 VL4 LK1 Cable (25.9628.0152)

Two 10-Pin MTA Connectors

Pos.	Wire	Wire Size	Description
1	YEL	22 AWG	START
2	GRN	22 AWG	EARTH GND.
3	ORG	22 AWG	I PRESENT
4	WHT	22 AWG	-15V
5	GRY	22 AWG	SHORT
6	BLU	22 AWG	+15V
7	BRN	22 AWG	LPS OVER TMP
8	RED	22 AWG	+20V
9	BLK	22 AWG	LAMP ON
10	PRP	22 AWG	INTENSITY

RED 10-POS MTA CONN.

1	YEL 22 AWG 8"
2	GRN 22 AWG 8"
3	ORG 22 AWG 8"
4	WHT 22 AWG 8"
5	GRY 22 AWG 8"
6	BLU 22 AWG 8"
7	BRN 22 AWG 8"
8	RED 22 AWG 8"
9	BLK 22 AWG 8"
10	PRP 22 AWG 8"

TO P4 ON VSB

RED 10-POS MTA CONN.

10	
9	
8	
7	
6	
5	
4	
3	
2	
1	

TO P6 ON MB

## 5.2.6 Yoke "A" 38 Inch Cable (25.9628.0145)

26-Pos MT Connector (Side A)

Pos.	Wire	Wire Size	Description
1	BLK	24 AWG	EARTH GND
2	BRN	24 AWG	TILT ENC-A
3	RED	24 AWG	TILT TACH +
4	ORG	24 AWG	TILT V+
5	YEL	24 AWG	EARTH GND
6	GRN	24 AWG	DOWSER-A
7	BLU	24 AWG	MO 1A
8	VIO	24 AWG	MO 1B
9	GRY	24 AWG	SENS1
10	WHT	24 AWG	MO2A
11	BLK/WHT	24 AWG	MO2B
12	BRN/WHT	24 AWG	+20V
13	RED/WHT	24 AWG	-15V

26-Pos MT Connector (Side B)

Pos.	Wire	Wire Size	Description
1	ORG/WHT	24 AWG	+5
2	YEL/WHT	24 AWG	TILT ENC-B
3	GRN/WHT	24 AWG	TILT TSCH -
4	BLU/WHT	24 AWG	N/C
5	VIO/WHT	24 AWG	N/C
6	GRY/WHT	24 AWG	DOWSER-B
7	RED/BLK	24 AWG	MO 1C
8	ORG/BLK	24 AWG	MO 1D
9	YEL/BLK	24 AWG	SENS2
10	GRN/BLK	24 AWG	MO 2C
11	BLU/BLK	24 AWG	MO 2D
12	VIO/BLK	24 AWG	+20V
13	GRY/BLK	24 AWG	EARTH GND

## 5.2.7 Yoke "A" 38 Inch Cable (continued) (25.9628.0145)

### 26-POS MT CONNECTOR (SIDE A)

			<i>TO P1 ON YTB</i>
1	BLK 24 AWG	1	
2	BRN 24 AWG	2	
3	RED 24 AWG	3	
4	ORG 24 AWG	4	
5	YEL 24 AWG	5	
6	GRN 24 AWG	6	
7	BLU 24 AWG	7	
8	VIO 24 AWG	8	
9	GRY 24 AWG	9	
10	WHT 24 AWG	10	
11	BLK/WHT 24 AWG	11	
12	BRN/WHT 24 AWG	12	
13	RED/WHT 24 AWG	13	

*TO P4 ON MB*

### 26-POS MT CONNECTOR (SIDE B)

		<i>TO P1 ON YTB</i>	
1	ORG/WHT 24 AWG	1	
2	YEL/HWT 24 AWG	2	
3	GRN/WHT 24 AWG	3	
4	BLU/WHT 24 AWG	4	
5	VIO/WHT 24 AWG	5	
6	GRY/WHT 24 AWG	6	
7	RED/WHT 24 AWG	7	
8	ORG/BLK 24 AWG	8	
9	YEL/BLK 24 AWG	9	
10	GRN/BLK 24 AWG	10	
11	BLU/BLK 24 AWG	11	
12	VIO/BLK 24 AWG	12	
13	GRY/BLK 24 AWG	13	

*TO P4 ON MB*

## 5.2.8 Yoke "B" 41 Inch Cable (25.9628.0147)

26-Pin Connector (Side A)

Pos.	Wire	Wire Size	Description
1	BLK	24 AWG	+20V
2	BRN	24 AWG	+20V
3	RED	24 AWG	MO 3A
4	ORG	24 AWG	MO 3B
5	YEL	24 AWG	SENS3
6	GRN	24 AWG	MO 4A
7	BLU	24 AWG	MO 4B
8	VIO	24 AWG	MO 5A
9	GRY	24 AWG	MO 5B
10	WHT	24 AWG	SENS5
11	BLK/WHT	24 AWG	MO 6A
12	BRN/WHT	24 AWG	MO 6B
13	RED/WHT	24 AWG	H.O.T.

26-Pin Connector (Side B)

Pos.	Wire	Wire Size	Description
1	ORG/WHT	24 AWG	+20V
2	YEL/WHT	24 AWG	+20V
3	GRN/WHT	24 AWG	MO 3C
4	BLU/WHT	24 AWG	MO 3D
5	VIO/WHT	24 AWG	SENS4
6	GRY/WHT	24 AWG	MO 4C
7	RED/BLK	24 AWG	MO 4D
8	ORG/BLK	24 AWG	MO 5C
9	YEL/BLK	24 AWG	MO 5D
10	GRN/BLK	24 AWG	SENS6
11	BLU/BLK	24 AWG	MO 6C
12	VIO/BLK	24 AWG	MO 6D
13	GRY/BLK	24 AWG	EARTH GND

## 5.2.9 Yoke "B" 41 Inch Cable (continued) (25.9628.0147)

### 26-POS MT CONNECTOR (SIDE A)

	BLK 24 AWG		
1	BRN 24 AWG	1	<i>TO P2 ON YTB</i>
2	RED 24 AWG	2	
3	ORG 24 AWG	3	
4	YEL 24 AWG	4	
5	GRN 24 AWG	5	
6	BLU 24 AWG	6	
7	VIO 24 AWG	7	
8	GRY 24 AWG	8	
9	WHT 24 AWG	9	
10	BLK/WHT 24 AWG	10	
11	BRN/WHT 24 AWG	11	
12	RED/WHT 24 AWG	12	
13		13	

*TO P5 ON MB*

### 26-POS MT CONNECTOR (SIDE B)

	ORG/WHT 24 AWG		
1	YEL/HWT 24 AWG	1	
2	GRN/WHT 24 AWG	2	
3	BLU/WHT 24 AWG	3	
4	VIO/WHT 24 AWG	4	
5	GRY/WHT 24 AWG	5	
6	RED/WHT 24 AWG	6	
7	ORG/BLK 24 AWG	7	<i>TO P2 ON YTB</i>
8	YEL/BLK 24 AWG	8	
9	GRN/BLK 24 AWG	9	
10	BLU/BLK 24 AWG	10	
11	VIO/BLK 24 AWG	11	
12	GRY/BLK 24 AWG	12	
13		13	

*TO P5 ON MB*

## 5.2.10 VL4 Lamp Wire A & B Assembly (25.9628.0149)

26-PoS Connector (Side A)

Pos.	Wire	Wire Size	Description
1	RED	24 AWG	5COND
2	BLK	24 AWG	5COND
R.T.	GRN	24 AWG	EARTH GND

RED 2-POS S30 CONN.



RED 2-POS S30 CONN.

RED 24 AWG 40"  
BLK 24 AWG 40"

RING TERMINAL

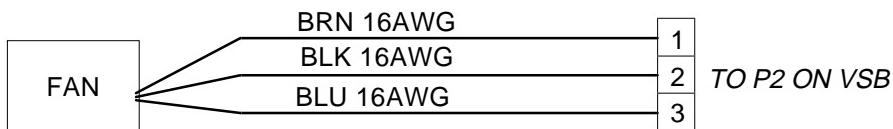
RING TERMINAL

## 5.2.11 VL4 Connectorized Fan (22.9628.0177)

3-Pos Mate-N-Lok

Pos.	Wire	Wire Size	Description
1	BRN	16 AWG	CAP
2	BLK	16 AWG	HI
3	BLU	16 AWG	FAN

3-POS MATE-N-LOK



## 5.2.12 Pan Motor Connections (22.4001.0001)

8-Pos MTA-100

Pos.	Wire	Wire Size	Description
1	BLK	22 AWG	PAN ENC-A
2	YEL	22 AWG	PAN ENC-B
3	WHT	22 AWG	GND
4	RED	22 AWG	+5V
5	WHT	22 AWG	PAN TACH+
6	BLU	22 AWG	PAN TACH-
7	RED	22 AWG	PAN V+
8	BLK	22 AWG	GND



## 5.3 Schematics and Wiring Diagrams

### 5.3.1 LVS Transformer Schematic

28" LEAD LENGTH	PRIMARY	FREQ. 50-60HZ	SECONDARY		
			RATED V RMS	RATED A RMS	LEAD LEN/COL
W/W	NOMINAL 110/220VAC	CORE 80x50x25MM			28"/YEL
B/W	0VAC				
	COMMON		0V		
	110VAC		10V	2.5A	28"/YEL
W/B	0VAC		25V	2.5A	28"/RED
	COMMON		0V		28"/ RED-YEL
B/B	110VAC		25V	2.5A	28"/RED

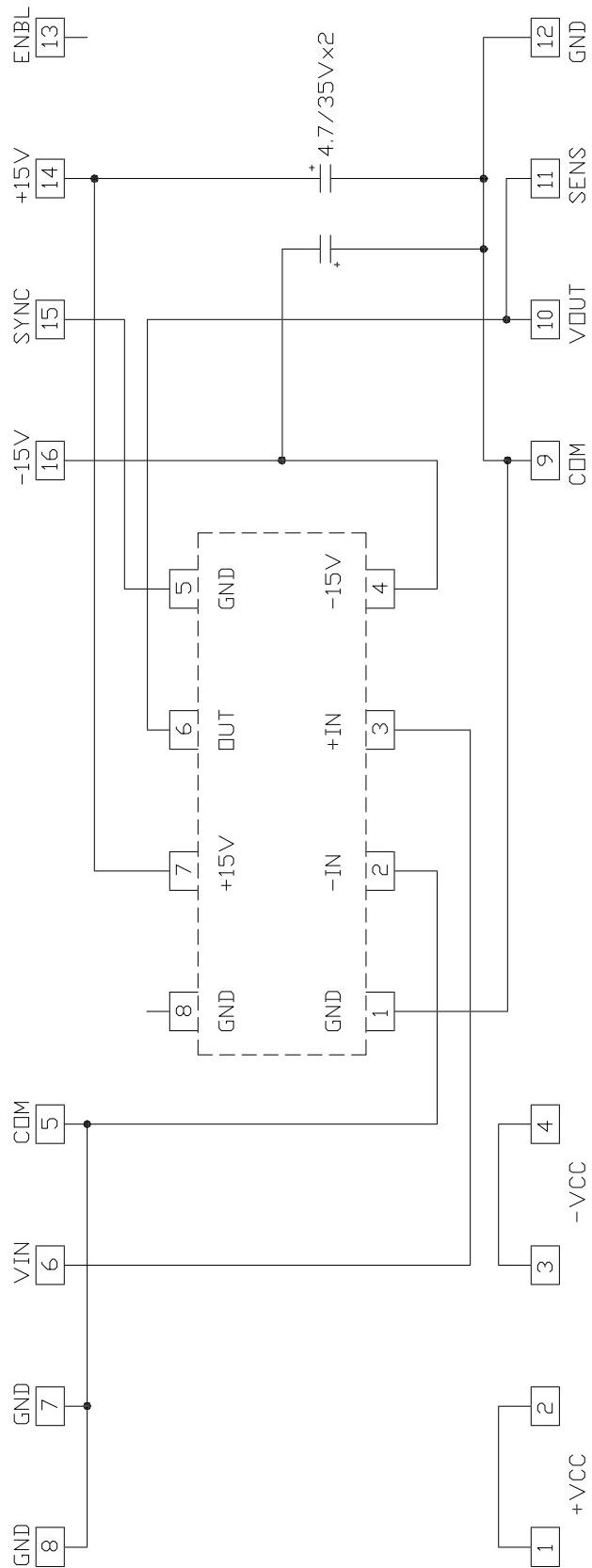
OPERATING RANGE:

80- 130VAC 110MODE  
160- 260VAC 220MODE

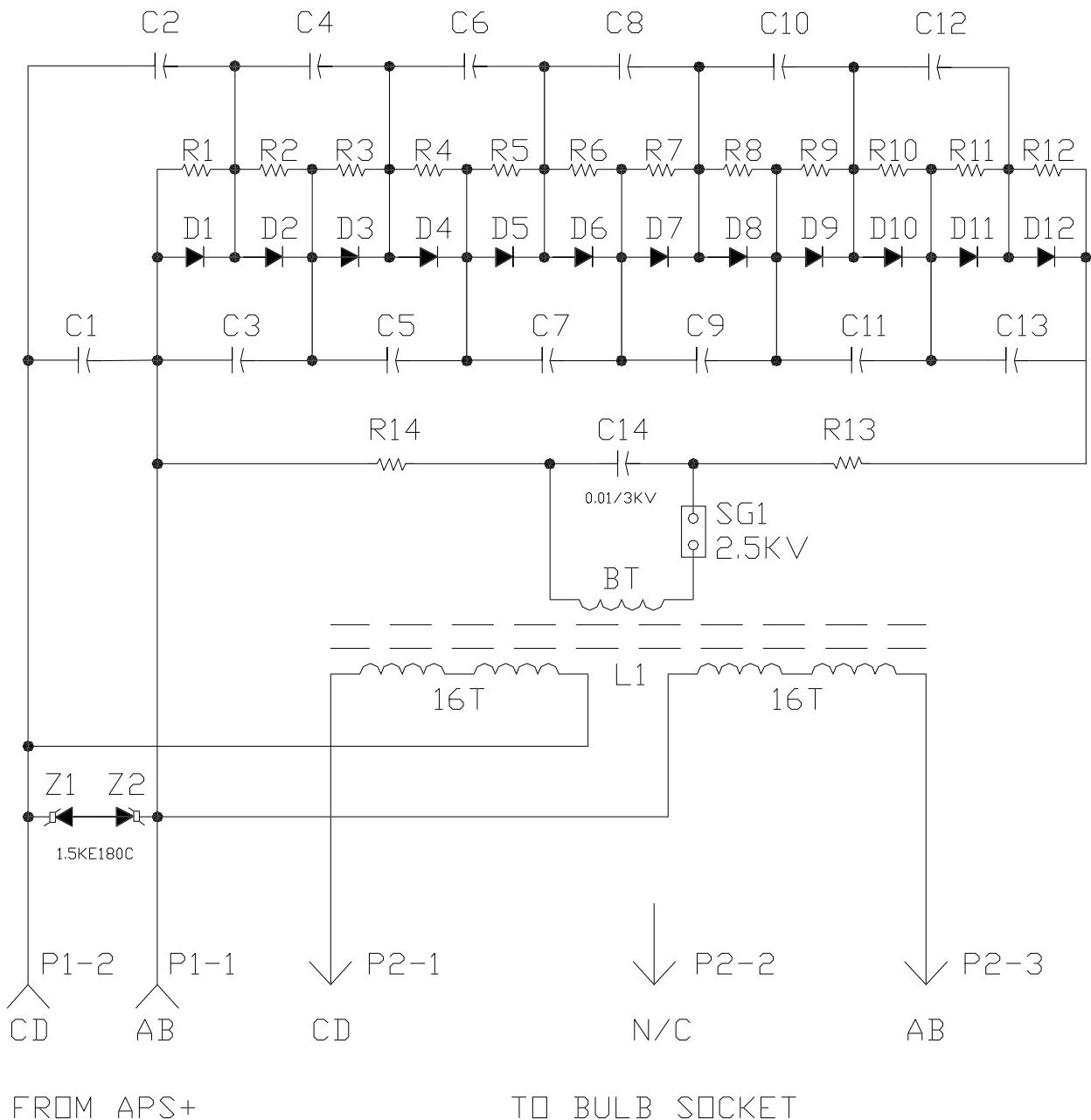
TALEMA P#0150-3-060A

BREAKDOWN	KV
PRI-PRI	1.5
PRI-SEC	3.0
SEC-SEC	.50

### 5.3.2 INA117 Emulator Board Schematic



### 5.3.3 Ignitor Board Schematic



### 5.3.4 Yoke Termination Board Schematic

